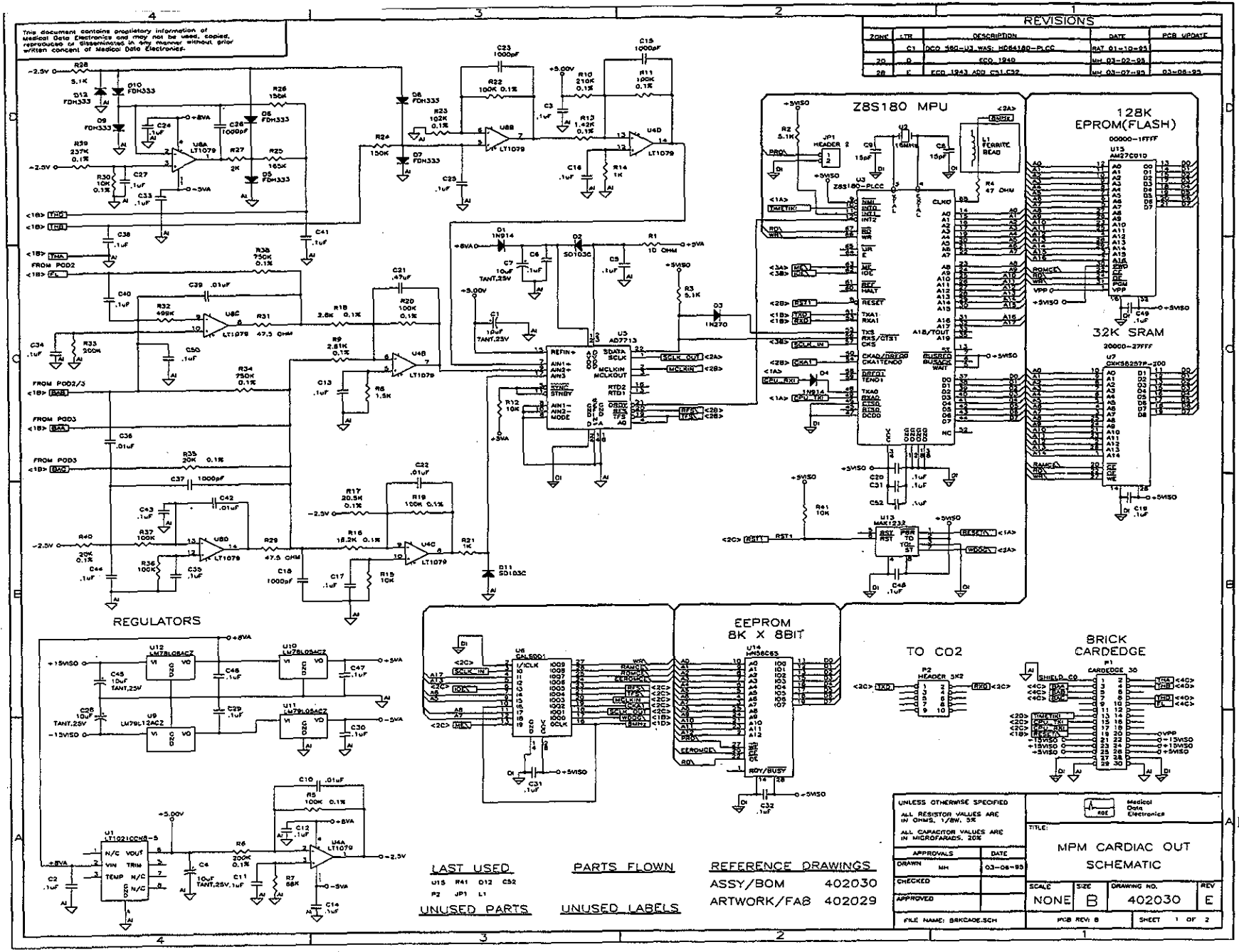


Figure 9-3: Cardiac Output Schematic
9-7 / 9-8

Table 9-2: Parts Listing, PCBA P/N 402030-0000, Cardiac Output Board (1 of 2)

MDE Part Number	Description	Quantity	Reference
352100-0102A	CAP, 1000PF,50V,10%,RAD,X7R TAPE & REEL	5	C15, 18, 23, 26, 37
352100-0103A	CAP, .01UF,50V,10%,RAD,X7R TAPE & REEL	5	C10, 22, 36, 39, 42
352100-0104A	CAP, .1UF,50V,10%,RAD,X7R TAPE & REEL	32	C2, 3, 5, 6, 11, 12, 13, 14, 16, 17, 19, 20, 24, 25, 27, 29, 30, 31, 32, 33, 34, 35, 38, 40, 41, 43, 44, 46, 47, 48, 49, 50
352100-0150A	CAP, 15PF,50V,10%,RAD,NPO EDPT TAPE & REEL	2	C8, 9
352100-0474A	CAP, .47UF,50V,10%,RAD,X7R TAPE & REEL	1	C21
352400-0106A	CAP, 10UF,25V,20%,RAD,TANT	5	C1, 4, 7, 28, 45
354000-0106A	CONN, DBL ROW,STRT,SGL PIN,SNAP-AWAY 36-PINS	2	JP1
354000-0317A	CONN, 5-PIN,M,DBL ROW,.1 CTR	1	P2
356000-0026A	XTAL, 16MHZ, LOW PROFILE, .142IN X .425IN	1	U2
364000-0109A	IC, 78LO5 +5V REG. TO-92 PKG.	1	U10
364000-0110A	IC, 79LO5 ACP -5V REG.	1	U11
364000-0208A	IC, LM79L12ACZ NEGATIVE 12V VOLTAGE REG LOW PWR	1	U9
364000-0237A	IC, Z8S180 18 OR 20 MHZ,PLCC	1	U3
364000-0246A	S*IC,51256,SRAM,SMD,32KX8,120NS,SOP28-P-450	1	U7
364000-0273A	IC, LT1021CCN8-5 PLASTIC DIP 8	1	U1
364000-0274A	IC, LT1079ACN PLASTIC DIP 14	2	U4, 8
364000-0278A	S*IC, 1 MEG,UNSECT FLASH PROM PLCC 32,SMD	1	U15
364000-0288A	S*IC, AD7713AR ANALOG TO DIG CONVRTR SOIC	1	U5
364000-0289A	S*IC, GAL 6001 PLCC	1	U6
364000-0290A	S*IC, HN58C65FP EEPROM SOP	1	U14
364000-0292A	S*IC, MAX1232 WATCHDOG TIMER SOIC SMD	1	U13
364000-0293A	IC, LM78L08ACZ VOLTAGE REGULATOR 8V TO92 LOW PWR	1	U12
365000-0168A	S*SKT, 68-PIN,LOW PROF,PLCC W/ LOCATING POSTS,SMD	1	SU3
365000-0232A	S*SKT, 32-PIN,LOW PROF,PLCC W/ LOCATING POSTS,SMD	1	SU15
365000-0428A	S*SKT, 28-PIN,LOW PROF,PLCC W/ LOCATING POSTS,SMD	1	SU6
370101-0100A	RES, 10,1/8W,5%,CF TAPE & REEL	1	R1
370101-0102A	RES, 1K,1/8W,5%,CF TAPE & REEL	2	R14, 21

Table 9-2: Parts Listing, PCBA P/N 402030-0000, Cardiac Output Board (2 of 2)

MDE Part Number	Description	Quantity	Reference
370101-0103A	RES, 10K,1/8W,5%,CF TAPE & REEL	3	R12, 15, 41
370101-0104A	RES, 100K,1/8W,5%,CF TAPE & REEL	2	R36, 37
370101-0152A	RES, 1.5K,1/8W,5%,CF TAPE & REEL	1	R8
370101-0154A	RES, 150K,1/8W,5%,CF TAPE & REEL	2	R24, 26
370101-0202A	RES, 2K,1/8W,5%,CF TAPE & REEL	1	R27
370101-0204A	RES, 200K,1/8W,5%,CF TAPE & REEL	1	R33
370101-0470A	RES, 47,1/8W,5%,CF TAPE & REEL	1	R4
370101-0470A	RES, 47,1/8W,5%,CF TAPE & REEL	2	R29, 31
370101-0512A	RES, 5.1K,1/8W,5%,CF TAPE & REEL	3	R2, 3, 28
370101-0683A	RES, 68K,1/8W,5%,CF TAPE & REEL	1	R7
370202-1653A	RES, 165K,1/8W,1%,MF TAPE & REEL	1	R25
370202-4993A	RES, 499K,1/8W,1% TAPE & REEL	1	R32
370205-1002A	RES, 10K,1/10W,0.1%,MF	1	R30
370205-1003A	RES, 100K,1/10W,0.1%,MF	5	R5, 11, 19, 20, 22
370205-1023A	RES, 102K,1/10W,0.1%,MF	1	R23
370205-1421A	RES, 1.42K,1/10W,0.1%,MF	1	R13
370205-1822A	RES, 18.2K,1/10W,0.1%,MF	1	R16
370205-2002A	RES, 20K,1/10W,0.1%,MF	2	R35, 40
370205-2003A	RES, 200K,1/10W,0.1%,MF	1	R6
370205-2052A	RES, 20.5K,1/10W,0.1%,MF	1	R17
370205-2103A	RES, 210K,1/10W,0.1%,MF	1	R10
370205-2373A	RES, 237K,1/10W,0.1%,MF	1	R39
370205-2611A	RES, 2.61K,1/10W,0.1%,MF	1	R9
370205-2801A	RES, 2.8K,1/10W,0.1%,MF	1	R18
370205-7503A	RES, 750K,1/10W,0.1%,MF	2	R34, 38
378000-0001A	DIO, 1N270 T&R	1	D3
378000-0005A	DIO, 1N914,SIGNAL T&R	2	D1, 4
378000-0075A	DIO, FDH 333, LOW LEAKAGE D035 PACKAGE	7	D5, 6, 7, 8, 9, 10, 12
378000-0080A	DIO, SD103C SCHOTTKY	2	D2,11
382000-0027A	FERRITE BEADS, .163 OD x .063 ID x .250 HEIGHT	1	L1
402029-0000	PCB, BRICK CARDIAC OUTPUT REV. A(E1820)	1	-

10 Recorder Option

10.1 Overview

Model 20100 and 20300 ESCORT II monitors may be equipped with an optional thermal recorder (Model 20002), see Figure 10-1. All alphanumeric and waveform data displayed on the monitor's screen may be sent to the recorder for printing.

If the recorder option is not included, a non-recorder configuration is installed to fill the recorder cavity in the ESCORT II monitor. The non-recorder configuration is shown in Figure 10-2.

ESCORT II monitors that do not include the Thermal Recorder option may be easily upgraded by replacing the non-recorder assembly with the Model 20002 Thermal Recorder.

Instructions for removing the Recorder Module may be found in Chapter 14, "ESCORT II Modules."

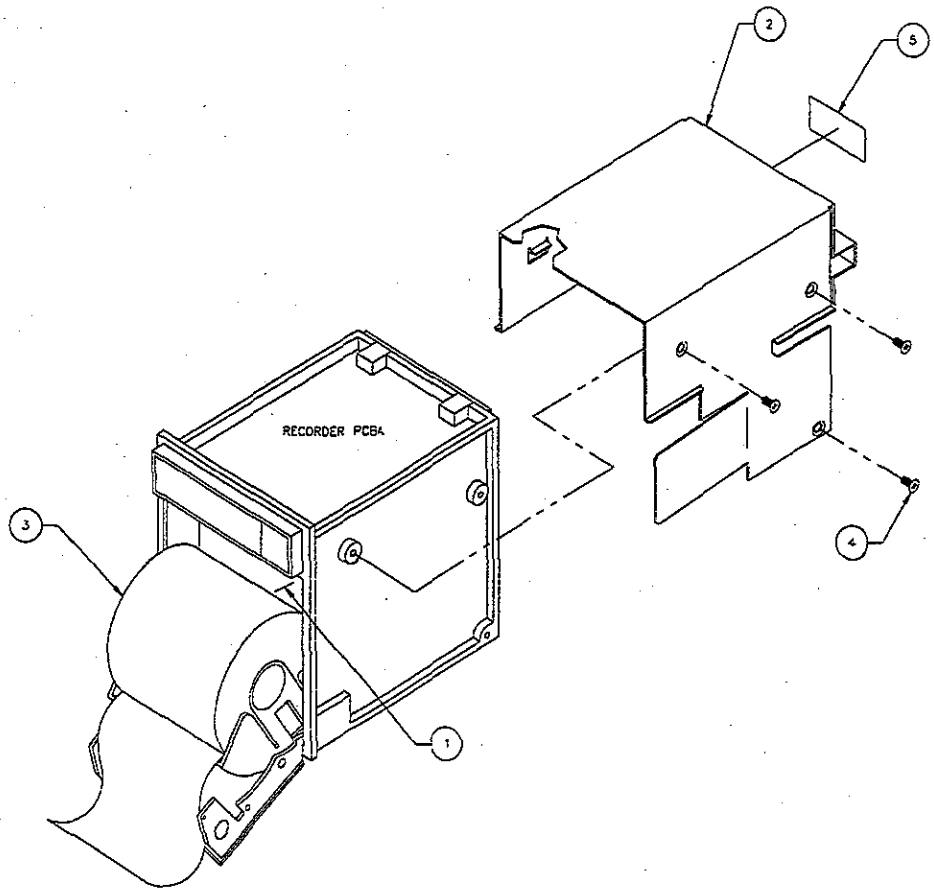


Figure 10-1: Model 20002 Thermal Recorder Option Assembly

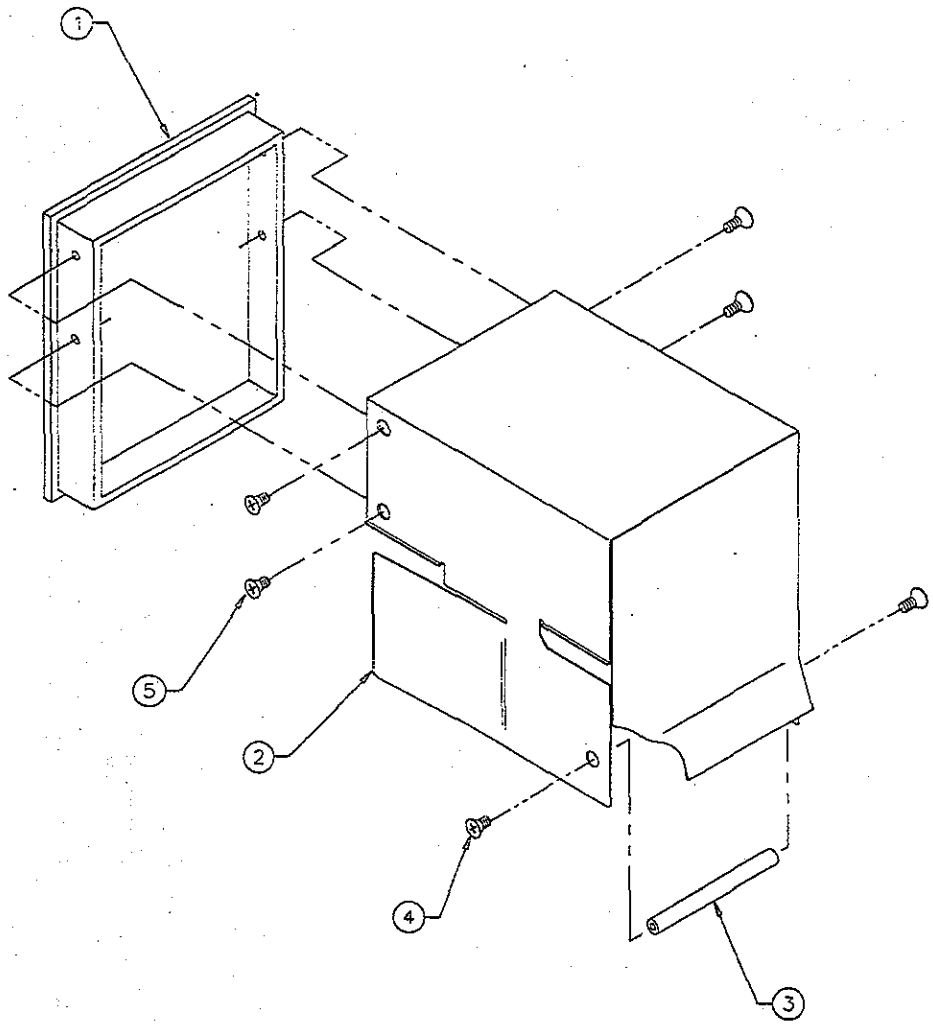
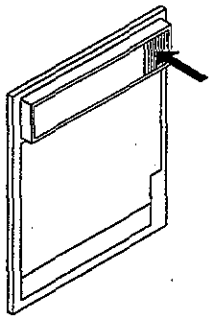


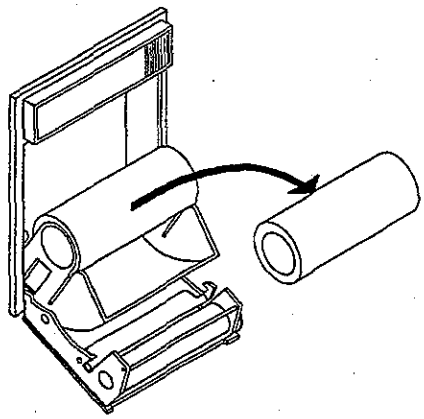
Figure 10-2: Model 20100/20300 Non-Recorder Assembly

10.2 Paper Removal and Replacement

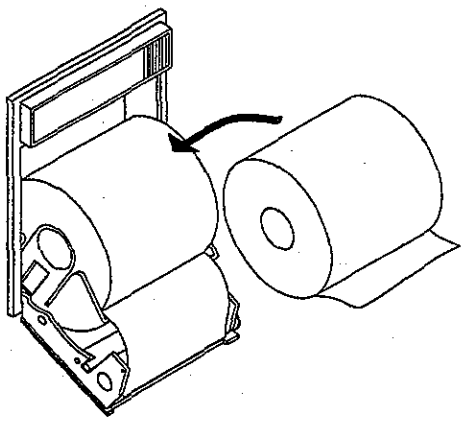
Perform the steps below to remove an empty paper spool and install a new roll of paper.



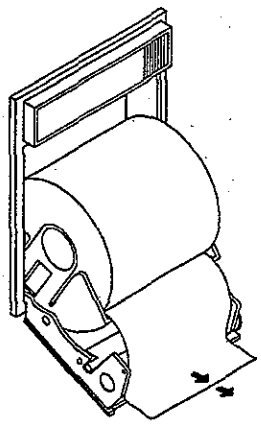
Step 1 - Depress the door release as indicated to open the recorder



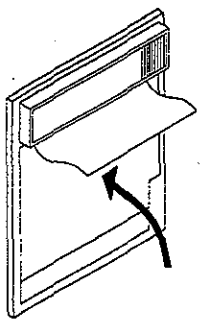
Step 2 - Remove the empty spool as shown



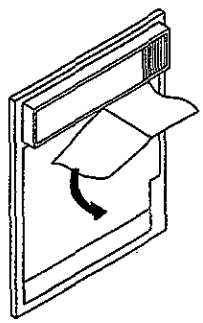
Step 3 - Install the new roll of paper as shown (note orientation)



Step 4 - Pull out 3 inches of paper and position paper between the paper guides



Step 5 - Close the recorder door; insure that the paper remains between the paper guides



Step 6 - Tear excess paper using downward motion as indicated (always tear the paper using this method)

Table 10-1: Parts Listing, Model 20002 Recorder Option Assembly, P/N 500260

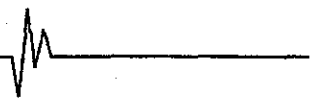
MDE Part Number	Description	Quantity	Reference
358100-0133A	SCR, TAPTITE,4 x 3/16 – LG,100DEG,FLH PHL STL Zn PLT	3	4
360600-0018A	#4 BENT GROUND LUG	1	7
366000-0008A	THERM.RCDR.PAPER,50MM WIDE, NO GRID, KANZAKI C692	1	3 - TO TEST
366000-0015A	RECORDER, MODEL AR42	1	1
378000-0036A	DIO, 1N5819,1AMP,SCHOTTKY T&R	1	6
399100-0010A	WIRE, BLACK 22GA. PVC, HOOK-UP 5000' MIN PER ROLL	-	8
401682-0000	RECORDER COVER E3B/E2B REV D (E1858)	1	2
401978-0000	LBL, SERIAL #, 1/2 – x 1 – ,E2B/E3B REV. B(E1612)	1	5

Table 10-2: Parts Listing, Non-Recorder Assembly, P/N 500261

MDE Part Number	Description	Quantity	Reference
358100-0043A	SCR, 4-40 X 3/16,PH,FLTHD,82DEG,S.S. UNDERCUT HEAD	2	4
358100-0119A	SCR, PLASTITE 4 x 3/8 – LG,100DEG,FLHPHL STL ZN PLT	4	5
360500-0104A	STNDOFF, 4-40 X 2.625 LG, 1/4 ROUND	1	3
401705-0000	NON-RCRDR COVER PLATE MOLDED E3B/E2B REV C (E1584)	1	1
401869-0000	NON-RECORDER HOUSING - E2B/E3B REV D (E1858)	1	2

Table 10-3: Model 20002 Thermal Recorder Replacement Parts

MDE Part Number	Description
358100-0022A	AR42 CHASSIS
358100-0023A	AR42 DRIVE ROLLER ASSY
358100-0024A	AR42 RECORDER DOOR
358100-0025A	PAPER HOLDER
358100-0026A	AR42 PRINTED CIRCUIT ASSY
358100-0027A	AR42 MOTOR ASSY
358100-0028A	AR42 PRINTHEAD
358100-0029A	AR42 PRINTHEAD BRACKET
358100-0030A	PAPER SENSOR BRACKET
358100-0031A	ACTUATOR
358100-0032A	COVER
358100-0033A	ANTI-STATIC BRUSH
358100-0034A	PRINTHEAD BRUSH
358100-0035A	PIVOT
358100-0036A	PIVOT SCREW
358100-0037A	PRINTHEAD ADJUST SPRING
358100-0038A	EJECTOR
358100-0039A	LATCH
358100-0040A	PAPER GUIDE
358100-0041A	ROLLER SHAFT
358100-0042A	ROLLER GEAR
358100-0043A	SWITCH CABLE ASSY



11 Mechanical Disassembly

11.1 Overview

This chapter provides the information necessary to disassemble the Prism monitor. The Multiparameter Module and Recorder Options will not be discussed in detail here, refer to Chapter 5 for the MPM and Chapter 10 for the Recorder.

> **WARNING: High voltages may be present! Use caution when handling electrical parts and assemblies as injury could occur. Technicians should wear a grounding wrist or ankle strap to increase personal safety and to avoid possible damage to the monitor. Read all disassembly instructions prior to performing any removal of parts.**

11.2 Fuse Holder/Voltage Selector and Fuse Replacement

The fuse holder contains the fuses and the voltage selector for the monitor. Open the door of this holder to replace fuses or to configure the voltage selection block (i.e.,115 VAC or 230 VAC). The present voltage setting can be read through the small rectangular window on the door of the holder. It is recommended that qualified technical service personnel replace fuses or change the voltage selection when necessary.

> **WARNING: For protection against fire, replace fuse only with one of the same type and rating.**

The Prism requires two identical slow blow 0.5A fuses for 115 VAC operation, or two slow blow 0.25A fuses for 220 VAC operation. Ensure that the AC power cord has been disconnected before replacing fuses. Carefully open the door of the fuse holder with a short 1/8" flat screwdriver. Replace the blown or defective fuse with one of the same type and rating. Noting orientation, gently slide the fuse holder back until it locks snugly into its original place. After the fuse replacement, the monitor may be connected to AC power.

11.3 Disassembly

I. Main Skin Removal
- A. Remove 5 rear screws.
- B. Remove any side screws next to the MPM housing.
- C. Remove or loosen 2 screws securing the recorder release tab.
- D. Slide the main skin backward.

II. Power Supply Removal
- A. Remove the Main Skin.
- B. Remove 2 side screws securing the power supply to the middle bulkhead.
- C. Remove the rear top screw securing the power supply
- D. Disconnect the AC, speaker, fan, battery and ext dc connectors from the power supply.
- E. Remove the power supply

III. Bezel Removal
- A. Remove the three bottom screws for the bezel.
- B. Carefully lift off the bezel and membrane assy (The membrane cable will be attached to the interface board).
- C. Remove the four screws behind the EMI tape on the display.
- D. Disconnect the two connectors from the inverter board.
- E. Disconnect the display cable from the interface board.
- F. Remove the display.
- G. Disconnect the membrane cable from the interface board.

IV. Inverter Board Removal
- A. Remove the Bezel per item III.
- B. Disconnect the inverter connecter on the interface board.
- C. Remove the two screws securing the inverter bracket.
- D. Remove the inverter board with bracket.
- E. Remove the two screws securing the inverter.
- F. Remove the inverter board from the bracket.
- G. Remove the cable from the board.

V. Interface Board Removal
- A. Remove the Bezel per item III.
- B. Disconnect the cable for the inverter.
- C. Remove the four screws securing the interface board.
- D. *Carefully* remove the interface board (37 pin connector attached to the video controller).

VI. Video Controller Board Removal

A. Remove the Interface board per item V.
B. Remove the Main Skin per item I.
C. Remove the five screws securing the video controller board.
D. *Carefully* remove the board from the CPU board.
E. Disconnect the video cable if necessary.

VII. CPU Board Removal

A. Remove the Video controller board per item VI.
B. Remove the Power supply board per item II.
C. Remove the five screws securing the CPU board.
D. Remove P3 and P1 (Defib & Aux) connectors.
E. *Carefully* remove the board (recorder cable may interfere)

11.3.1 Fan Removal

Remove the outer shell first.

Disconnect the fan connector, J9, from the power supply board. Remove the two Phillips screws from the opposite corners of the fan. The fan may now be removed from the chassis.

11.3.2 Speaker Removal

Remove the outer shell first.

Disconnect the speaker connector, J3, from the power supply board. Remove the four Phillips screws from the four corners of the speaker mounting bracket. The speaker may now be removed from the chassis.

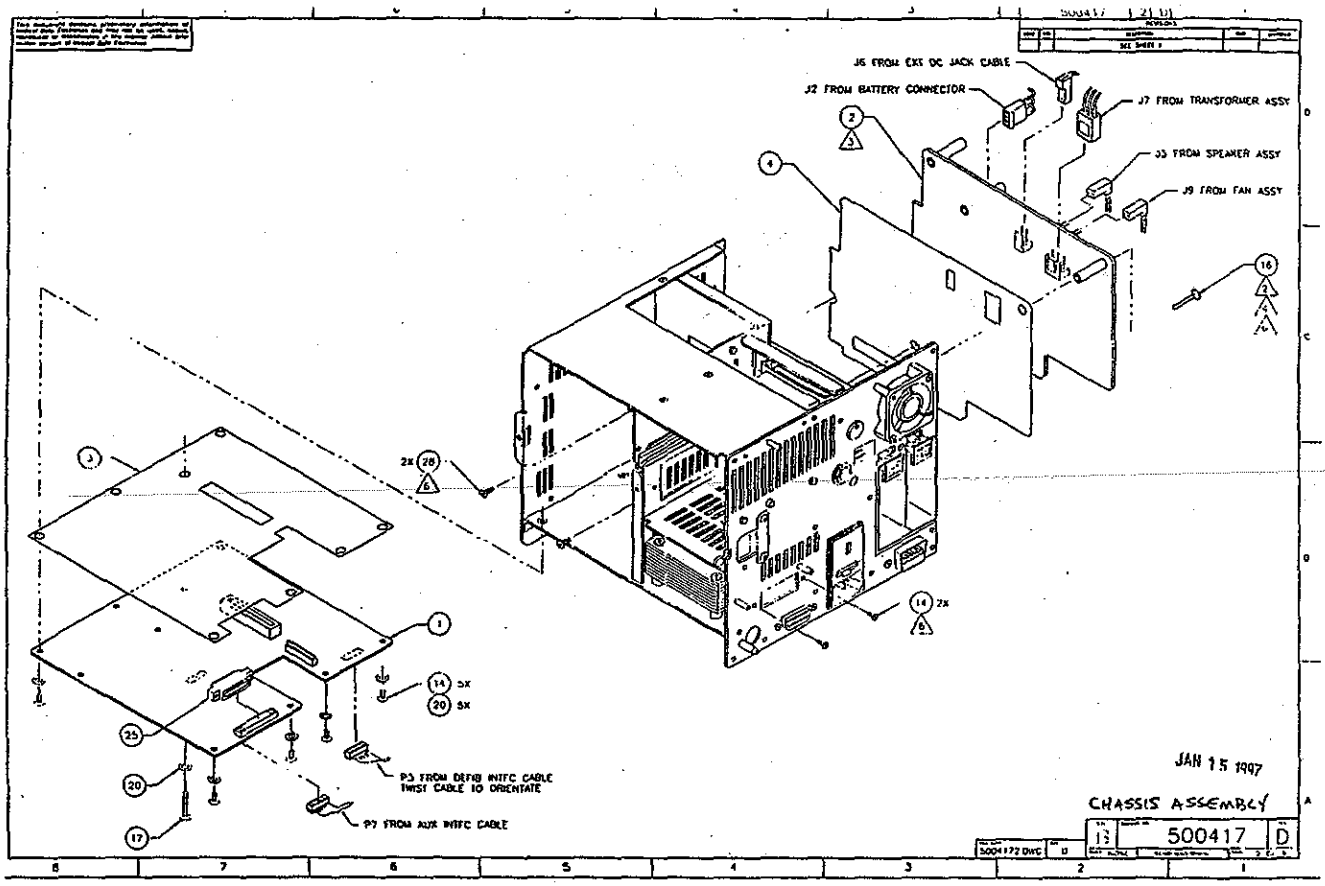


Figure 11-4: Prism Chassis Assembly

500417 CHASSIS ASSY,E3B PLUS PRISM,10.4 VGA REV. E(E2574)

MDE Part Number	Description	Quantity	Reference
354000-0279A	CONN, 20-PIN,CE20,CARD EDGE	1	25
354000-0379A	CONN, .187 X .032, QK DISCONN FLAG TERM. 22-18AWG	1	32
358100-0021A	SCR, 4-40 X 1/4,PH FLTHD,100 DEG,ZN	2	28 - DO NOT ISSUE
358100-0036A	SCR, 4-40 X 1/4,PH PNHD,ZINC OR ANY	7	14 - DO NOT ISSUE
358100-0041A	SCR, 6-32 X 1/4 PHL PNHD	1	27 - DO NOT ISSUE
358100-0087A	SCR, 4-40 x 1 IN,PH PNHD	1	16 - DO NOT ISSUE
358100-0090A	SCR, 4-40 x 5/16 PH PNHD PLATED	2	26 - DO NOT ISSUE
358100-0132A	SCR, TAPTITE,#4 x 3/16~LG PHL PNH STL ZN PLATE	9	13 - DO NOT ISSUE
358100-0133A	SCR, TAPTITE,4 x 3/16~LG,100DEG,FLH PHL STL Zn PLT	10	15 - DO NOT ISSUE
358100-0136A	SCR, TAPTITE,#4 x 1/2~LG,PHL PNH STL ZN PLATE	2	17 - DO NOT ISSUE
358200-0004A	WSHR, #4 FLAT STL ZINC,(.125ID,9/32OD,.025THK)	2	29 - DO NOT ISSUE
358200-0006A	WSHR, #6 FLT STL ZINC	8	23 - DO NOT ISSUE
358200-0007A	WSHR, #4 INT TOOTH	6	20 - DO NOT ISSUE
358200-0009A	WSHR, #4 SPLIT LOCK	2	19 - DO NOT ISSUE
358200-0010A	WSHR, #6 SPLT LCK	8	24 - DO NOT ISSUE
360500-0023A	NUT, #6 HEX,LRG PTRN	10	22 - DO NOT ISSUE
360600-0047A	LUG, #6, INT. TOOTH, 7/8 IN LONG	1	33
360600-0048A	DOME HOLE PLUG 1/2 DIA	1	18
399100-0025A	WIRE, GRN/YELL 18GA,PVC,HOOK-UP 5000'/RL,.075 DIA	1	30
400747-0000	SPRING, PER MDE SPECS, TA-2092 W/20% ADDL STRENGTH	1	11
401247-0000	E3/E2B/E2B BATTERY PACK W/ LABEL ASSY REV. A	2	21
401684-0000	GUIDE PIN E3B/E2B REV. B(E1909)	2	9
401881-0000	SPEAKER ASSY E3B REV C1(D642)	1	8
401887-0000	SUB-CHASSIS ASSY E3B REV I (E2194)	1	7 - DO NOT ISSUE
401892-0000	FISH PAPER CPU MOTHER PCBA E3B REV. B(E1431)UNUSED	1	3
401893-0000	FISH PAPER, POWER SUPPLY PCBA E3B REV. B(E1431)	1	4
401978-0000	LBL, SERIAL #, 1/2 IN x 1 IN,E2B/E3B REV. B(E1612)	1	10 - DO NOT ISSUE
402133-0000	EXT DC JACK ASSY E2B/E3B REV. C1 (D562)	1	12
402822-0000	PCBA, E3B PLUS POWER SUPPLY REV. D(E2523)	1	2 - DO NOT ISSUE
402915-0000	FISH PAPER, NEW E3B/E3B+ CPU REV. A(E2194)	1	3
402941-0000	REAR BEZEL MOLDED,E3B+ PRISM,10.4VGA REV. A(E2400)	1	31
402944-0000	COVER, MLDED,VGA PRT,E3B+ PRSM,10.4VGA REV.A(E2400	1	34
402947-0000	FRNT PNL ASY,BASE MNTR,E3B+PRSM,10.4VGA REV.B(2547	1	6 - DO NOT ISSUE
403023-0000	PCBA, CPU VGA COMPATABLE REV. A1(D684)	1	1 - DO NOT ISSUE
403098-0000	REAR PANEL ASSY E3B PLUS REV. B(E2483)	1	5 - DO NOT ISSUE
403099-0000	REAR PNL ASSY(FILTERED PWR MOD)E3B+ REV. D(E2574)	1	5 - DO NOT ISSUE

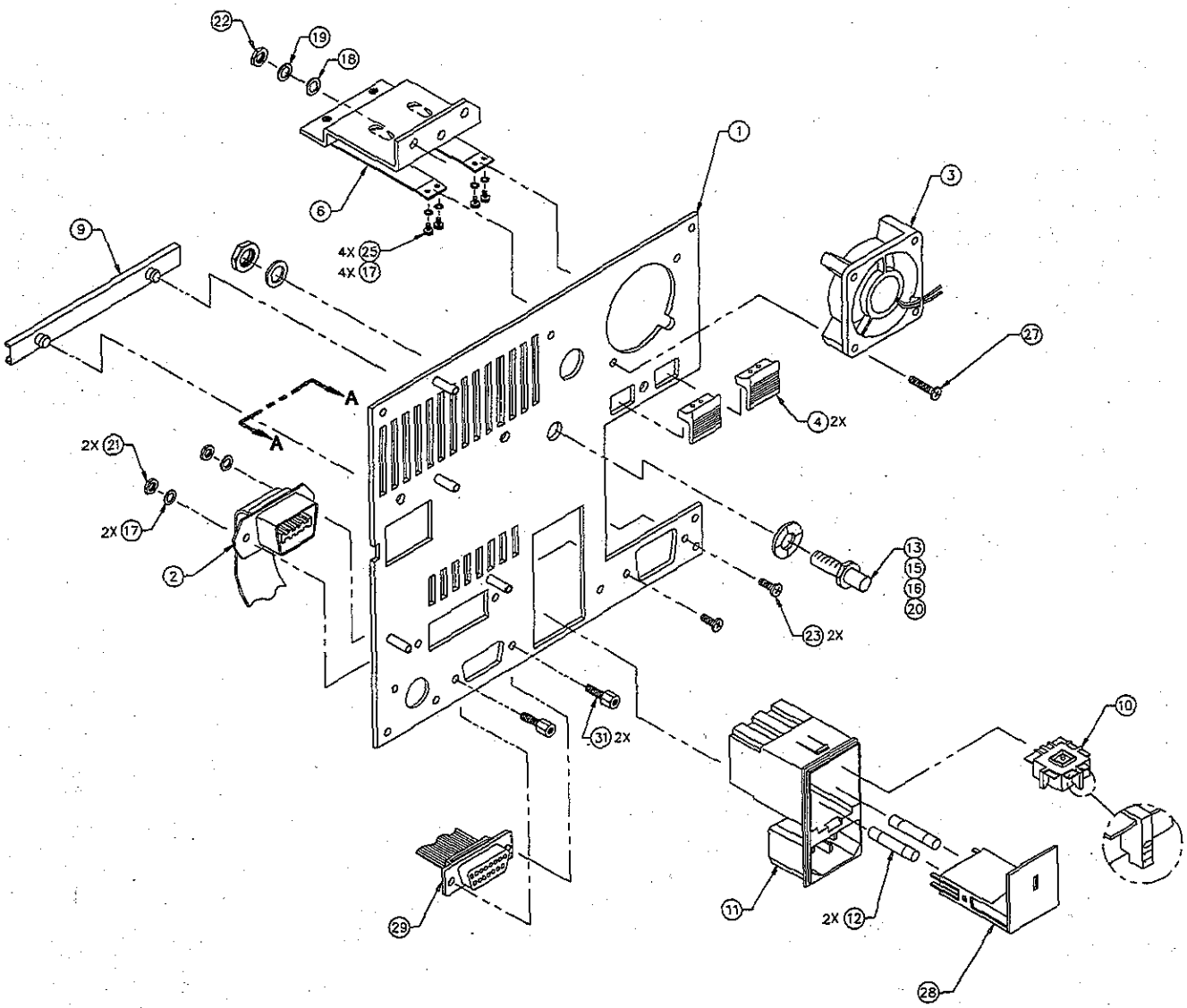


Figure 11-5: Prism Rear Panel Assembly

Table 11-5: Parts Listing, Rear Panel Assembly

MDE Part Number	Description	Quantity	Reference
354000-0195A	CONN, EQUIPOTENTIAL MCPOAG PLUG S 6/15 (EURO EII)	1	13
358100-0051A	SCR, 2-56 X 3/16,SKTHD,BLK	4	25
358100-0057A	SCR, 2-56 X 5/16,BUTTON HD,SKT,BLK	2	23
358100-0156A	SCR, TAPTITE #4 x 11/16~LG PHLPNH STL ZN	2	27
358200-0006A	WSHR, #6 FLT STL ZINC	2	18
358200-0010A	WSHR, #6 SPLT LCK	2	19
358200-0020A	WSHR, #2 INT TOOTH,ZINC OR NICKEL PLATING	6	17
358200-0029A	WSHR, F/M 6,LOCK,SERRATED	1	16
358200-0030A	WSHR, COLOUR CODE (YELLOW-GREEN)	1	15
360300-0022A	FUSE .5AMP 250V 5MMX 20MM,SLO BLO,E3	2	12
360300-0026A	POWER MODULE, AC W/VOLT SELECT	1	11
360300-0027A	FUSE HOLDER, VOLT SELECT	1	28
360500-0007A	HARDWARE, SCREWLOCK KIT	2	31
360500-0020A	NUT, 2-56 HEX	2	21
360500-0023A	NUT, #6 HEX,LRG PTRN	5	22
360500-0069A	NUT, MU,0.8,d/M 6	1	20
384000-0178A	CARD GUIDE, SNAP IN, 3 1/2 LONG	1	9
384000-0186A	VOLTAGE SELECT INSERT 115/230V	1	10
385000-0000A	TY-WRAPS, 3IN LENGTH (1000/BAG)	1	30
401076-0000	HANDLE E3 MONITOR REV. A	2	4
401240-0000	BATTERY RESTAIN ASSY E3/E3B REV. C(E1431)	1	6
401686-0000	*MOD* REAR PANEL E3B REV H (E1839)	1	1
401881-0000	SPEAKER ASSY E3B REV B (E1724)	1	7
401884-0000	FAN ASSY, E2B/E3B REV B (E1430)	1	3
401885-0000	AUXILIARY INTERFACE CABLE ASSY E3B REV B1(D485)	1	29
402005-0000	CABLE, E3B TORROID, FERRITE CORE ASSY REV E(E1692)	1	8
402133-0000	EXT DC JACK ASSY E2B/E3B REV. C1 (D562)	1	5
402185-0000	CBL, DEFIB INTERFACE E3B REV C (E1628)	1	2

12 Performance Check

12.1 Overview

MDE recommends a yearly performance check to verify all functions on the ESCORT II 300 monitor. Perform only the tests necessary for the options and parameters installed in your monitor. A checklist is included at the back of this section which may be photocopied and completed each time the performance check is done. At the conclusion of the performance check, turn power off and back on again. Ensure that all default settings return.

The following equipment (or equivalent) is necessary to do the performance tests. Refer to the manufacturer's operating procedures for detailed information. All test equipment used should be in good working condition and calibrated, if necessary.

MDE Datasim 6000 Patient Simulator
Resistive 3-lead and 5-lead ECG cables and leads
IEC-601.1 Continuity Tester
ECG shorting plug (All leads shorted together)
IBP shorting plug (All leads shorted together)
TEMP shorting plug (All leads shorted together)
Hipotronics AC Hipot Tester Model HA 3ATC with Hipotronics Safety Switch
Ohmic Instruments, Biomedical Electrical Test Set Model BET-300A
Variac/current box
DC power supply with 3.5 mm connector
Invasive blood pressure cable
NELLCOR PT-2500 simulator and patient cable with finger sensor DS-100A
Dynatech Nevada CuffLink NIBP Analyzer with cuff and hoses
Digimanometer Electro-Diagnostic Model DGM-2 with 250 mL volume cannister
Fogg Temperature Simulator TP400/700
Fogg BP Simulator BP-600
Stopwatch
CO_2 sensor cable with disposable airway adapter
Precision resistance (1%) boxes, two required (used for Cardiac Output testing)

Begin with a thorough visual inspection of the unit. Inspect the power cord for cracks or exposed conductors. Replace power cord, if defective.

12.2 Leakage Test

> **WARNING: Disconnect the AC power cord, remove all batteries (if installed), and disconnect all cables connected to the ESCORT II before performing the leakage test.**

12.2.1 MPM Leakage/Hipot Test

Connect the ECG shorting plug to the ECG input on the monitor. Connect the ground lead of the AC Hipot Tester to the ground pin at the AC power input of the ESCORT II. Connect the Hipot "hot" lead to the ECG shorting plug. Press the Safety HV switch and turn on the Hipot Tester and set leakage knob to full clockwise position. Turn output dial slowly to 2,600 V and wait for 10 seconds. Ensure that there is no cracking or arcing inside the ESCORT II monitor, and that the Hipot Tester alarm does not sound. At the conclusion of this test, turn output dial to zero, and remove the shorting plug.

If the monitor is equipped with the IBP option, repeat the above test using an IBP shorting plug. If the monitor is equipped with the TEMP option, repeat the above test using the TEMP shorting plug. Remove any shorting plugs at the conclusion of the test.

12.2.2 Patient Input Leakage

Connect the ECG shorting plug to the ESCORT II's ECG input. Set the Biomedical Electrical Test Set to read patient input leakage. Connect the AC outlet of the Test Set to the AC input of the ESCORT II monitor. Connect the Test Set's RL clip lead to the ECG shorting plug. Select LEADS TO GND on the Test Set. Press the ALL LEADS button on the Test Set. Ensure that the leakage current is less than 10 µA. Select CASE TO GND and NORM on the Test Set. Ensure that the leakage current is less than 20 µA (The maximum allowable current at the end of the shorting cable). Switch NORM to REV on the Test Set. Ensure that the leakage current is less than 20 µA. Disconnect the shorting plug attached to the ESCORT II monitor at the end of this test.

12.3 Safety Test

> **WARNING: Disconnect the AC power cord and remove all batteries (if installed) before performing the safety test.**

12.3.1 Chassis Ground Resistance Test

Connect the AC plug of the IEC-601.1 Continuity Tester to the AC input of the ESCORT II monitor. Using the test probe of the Continuity Tester, make contact to unpainted metal on the monitor. Turn the tester to ON, and ensure that the green PASS LED is illuminated. Remove the recorder, if installed. See Chapter 13, "ESCORT II Modules," for details on removing the recorder. Repeat the chassis ground resistance test to the recorder guide posts, and other unpainted metal portions on the monitor. Disconnect the AC plug at the conclusion of this test.

12.3.2 Chassis Leakage/Hipot Test

Connect the plug of the Hipot/chassis interface cable (regular AC power cord) to the High Voltage socket of the Hipotronics Safety Switch. Connect the socket end of the Hipot/chassis interface cable to the AC receptacle located on the rear panel of the ESCORT II. Set the leakage knob of the Hipot Tester to maximum clockwise position. Press the High Voltage button and slowly turn the Hipot Tester to 1500 VAC for a duration of 5 seconds. Ensure that the Hipot Tester alarm does not sound.

12.4 Keypad Check

Turn the ESCORT II on and ensure that every key initiates its specified function. Verify that there is an audio click when each key is pressed. Perform this test on every key.

12.5 Mainframe Check

12.5.1 Mainframe Software

Press the **PAGE HOME** function key. Press the **NEXT PAGE** function key twice. Press the **TEST** softkey. Each parameter listed is followed by a communications code and its software version. Communication status codes are as follows:

- ***OK*** - No faults detected; normal operating state
- ***I*** - Parameter is INHIBITED by user configuration in monitor (parameter selection; i.e., RESP vs. RESPCO2, indicating that only one source of respiration may be active at a given time, e.g., Respiration via impedance pneumography vs. Respiration via $ETCO_2$)
- ***D*** - Parameter is DISABLED by user configuration in monitor (PRAM AVAIL field in power-up defaults)
- ***V*** - Version (protocol revision) mismatch between parameter and monitor; contact MDE Technical Support
- *#* - Any numeric codes displayed for COMM status should be relayed to MDE Technical Support for further direction

12.5.2 Date and Time Check

Press the **PAGE HOME** function key. Press the **NEXT PAGE** function key twice. Press **TEST**, and then press the **STAT INFO** softkey to highlight **SW**. Check the ESCORT II for correct date and time. Make changes as necessary. Refer to the ESCORT II 300 Operator's Manual to change the date and time.

12.5.3 Line Frequency Check

While the monitor is set to the **STAT INFO SW** page, ensure that the AC line frequency is 60 ± 0.05 Hz. For 50 Hz systems, ensure that the AC line frequency is 50 ± 0.05 Hz.

12.5.4 System AC Current Check

Release the batteries from their slots. Plug the power cord of the ESCORT II into a variac. Set the variac at 115 VAC. Ensure that the current meter reads less than 500 mA. Reinstall the batteries into the slots of the ESCORT II when complete.

12.5.5 External DC Operation

Remove the AC power source from the ESCORT II monitor. Remove the batteries, if present, from their slots. Set an external DC power supply (rated at a minimum of 45 VA) to 20 ± 8 VDC. Connect the DC output to the external DC connector at the back of the monitor using the 3.5 mm connector (center pin positive). Ensure that the monitor operates normally.

12.6 Batteries Check

Note: Never discharge the batteries completely. To ensure long battery life, always recharge batteries immediately after use. An optional battery charger (MDE Part Number: E2700-12) is recommended. Batteries should be replaced every two (2) years regardless of test results. Used batteries should be recycled or disposed of properly.

12.6.1 Battery Operation

Note: Battery test should be performed on recently charged batteries.

Remove the AC power source from the ESCORT II monitor. Ensure that both the AC ON and BATTERY CHARGING LEDs are off. Press the **PAGE HOME** function key. Press the **NEXT PAGE** function key twice. Press **TEST**, and then press the **STAT INFO** softkey to highlight **SW**. With one (1) battery installed, ensure that the battery level indication is displayed and that the ESCORT II monitor operates properly. Switch the location of the battery by releasing the installed battery and inserting the same battery into the other slot. Repeat the above test for each available battery.

12.7 Recorder Check

Note: Ensure that an adequate amount of paper is installed in the recorder. See Chapter 10, "Recorder Option," for details on installing a new roll of paper, if necessary.

12.7.1 Single Parameter Recording Check

Press the **PAGE HOME** key. Then press the **RECORD** function key for a 16-second strip of ECG waveform. To specify other parameters to record, press the softkey of the desired parameter within two seconds *after* pressing the **RECORD** key. Ensure that the recorder prints a single channel. Verify that tick marks are printed every 7.5 cm at the bottom of the strip (when the sweep speed is set to 25 mm/sec). Figure 12-1 shows a typical single parameter recording.

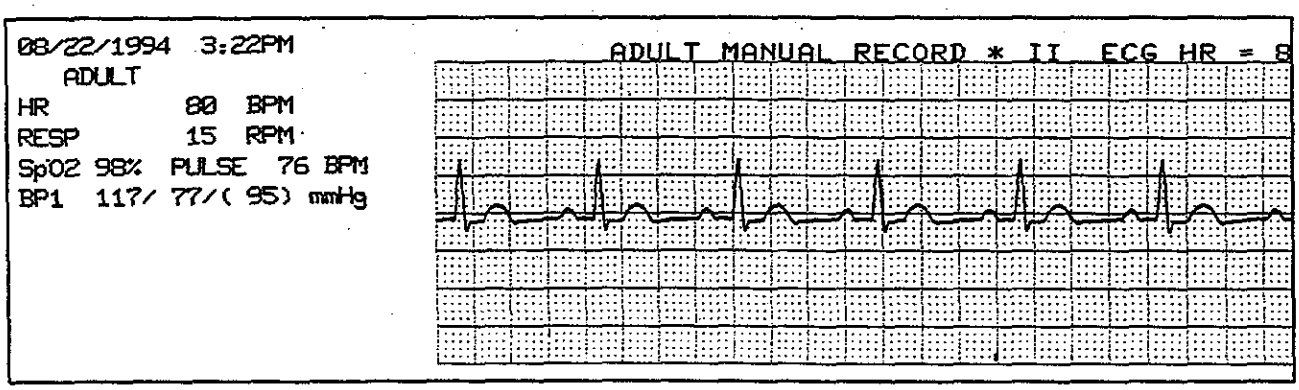


Figure 12-1: Single Parameter Recording

12.7.2 Dual Parameter Recording Check

Dual parameter recordings may be accomplished by pressing the **RECORD** key followed by pressing the softkeys of each of the two desired parameters (within two seconds). The first parameter selected will be printed on the top recording trace and will determine the sweep speed of the recording strip. Ensure that the recorder prints two (2) traces. Verify that tick marks are printed every 7.5 cm at the bottom of the strip (when the sweep speed is set to 25 mm/sec). Figure 12-2 presents a dual parameter recording.

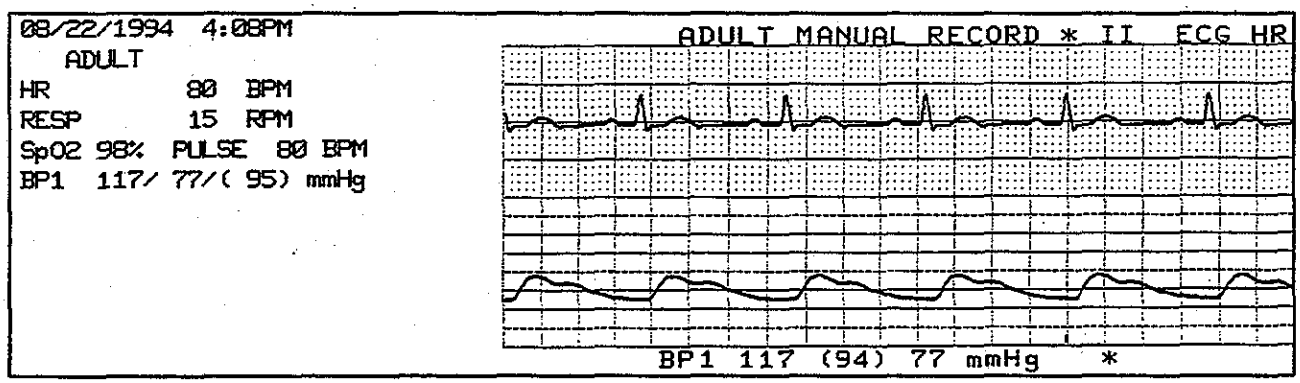

08/22/1994 4:08PM
ADULT
HR 80 BPM
RESP 15 RPM
SpO2 98% PULSE 80 BPM
BP1 117/ 77/(95) mmHg
ADULT MANUAL RECORD * II ECG HR
BP1 117 (94) 77 mmHg *

Figure 12-2: A Dual Parameter Recording

12.7.3 Trend Check

After parameter data has been accumulated, press the **PAGE HOME** key. Then press the **NEXT PAGE** key twice. On the **SYSTEM SETUP** page, press the **TREND** key to display graphical trends.

12.8 ECG Tests

*Note: **When using a patient simulator, the tolerance factor of the simulator must be considered in determining if the monitor is within tolerance.***

12.8.1 ECG Lead Check

Connect a 5-lead ECG cable to a calibrated patient simulator. Connect the ECG cable to the ECG connector of the ESCORT II monitor. Press the **PAGE HOME** function key. Press the softkey adjacent to the ECG label. Set the sweep speed to 25 mm/sec. Press the **LEAD SEL** softkey. Select 5-lead mode. Ensure that an acceptable ECG waveform is displayed. Refer again to Figure 12-1.

12.8.2 Lead Fail and Baseline Reset Tests

Ensure that the ESCORT II is still set to 5-lead mode. Remove one lead from the patient simulator. Observe **CHK LEADS** message on the monitor's screen. Repeat for LL, LA, RA, RL, and V leads. Ensure that when any patient lead is disconnected and reconnected, the baseline returns to normal within two (2) seconds.

The ECG waveform may continue to be displayed upon disconnecting a given lead. This case arises when a 5-lead cable is used and a lead which is not used to extract the ECG waveform is disconnected (e.g., RL disconnected when monitoring Lead II). A "reset flag" will be temporarily displayed on the ECG waveform when the lead(s) become disconnected, as shown in Figure 12-3. The reset flag will disappear in a few seconds, and the ECG waveform will appear again.

Connect a 3-lead ECG cable to the patient simulator. Select 3-lead mode and ensure that Lead II is selected. Remove one lead from the patient simulator. Observe the **CHK LEADS** message on the screen. Repeat for LL, LA, and RA leads.

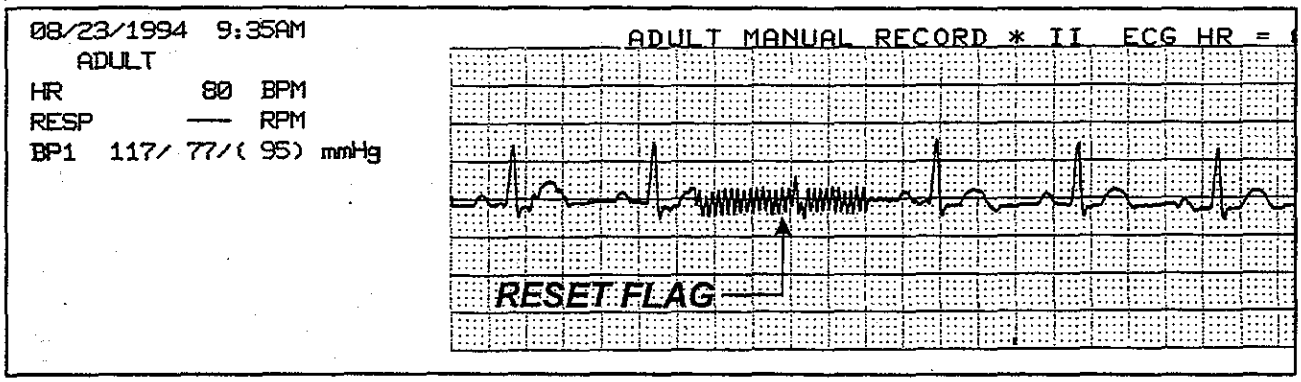


Figure 12-3: Check Leads Condition with Valid ECG Waveform

12.8.3 High/Low Alarm Function Check

Turn on ECG alarms using the **ALARM ON/OFF** softkey. Set the ECG output of the patient simulator higher than the high alarm limit. Ensure that the alarm tone sounds. Set the patient simulator ECG output lower than the low alarm limit. Ensure that the alarm tone sounds. If the monitor is equipped with a recorder, observe alarm recording. Ensure that the red ALARM LED is flashing.

12.8.4 Pacer Flag Insertion Check

Press the **PAGE HOME** function key. Press the softkey adjacent to the ECG label. Press the **NEXT PAGE** function key. Set simulator to output a paced waveform. Set the **PACE ON/OFF** softkey to ON. Ensure that the pace spikes are replaced with uniform pacer flags and that the heart rate indicated on the ESCORT II returns to the simulator rate.

12.8.5 ECG Calibration

*Note: **Disconnect all parameter cables (except the ECG cable) during this test. Ensure that ECG is set to monitor Lead II.***

Press the **PAGE HOME** function key. Press the softkey adjacent to the ECG label. Press the **NEXT PAGE** function key. Press the **CAL** softkey and verify the calibration pulse on the monitor's screen. Increase the waveform size, using the **SIZE** softkey, if necessary. Run a recorder strip and verify that the R-wave amplitude is 1 mV peak-to-peak from the isoelectric line to the R-wave peak ± 0.1 mV.

If the ESCORT II is not equipped with a recorder, press the **CAL** softkey. Ensure that a calibration pulse is generated on the screen and that the ECG amplitude is within 15% of the calibration pulse amplitude. Refer to Figure 12-4 for details.

12.8.6 QRS Tone Check

Ensure that the heart rate source is set to **AUTO** or **ECG**. Refer to the ESCORT II 300 Operator's Manual for details on setting the heart rate source. Press the **PAGE HOME** function key. Press the softkey adjacent to the ECG label. Press the **NEXT PAGE** function key. Set the **TONE ON/OFF** softkey to ON. Ensure that a tone sounds which corresponds to each R-wave in the ECG waveform. Silence the tone by pressing the **TONE ON/OFF** softkey again.

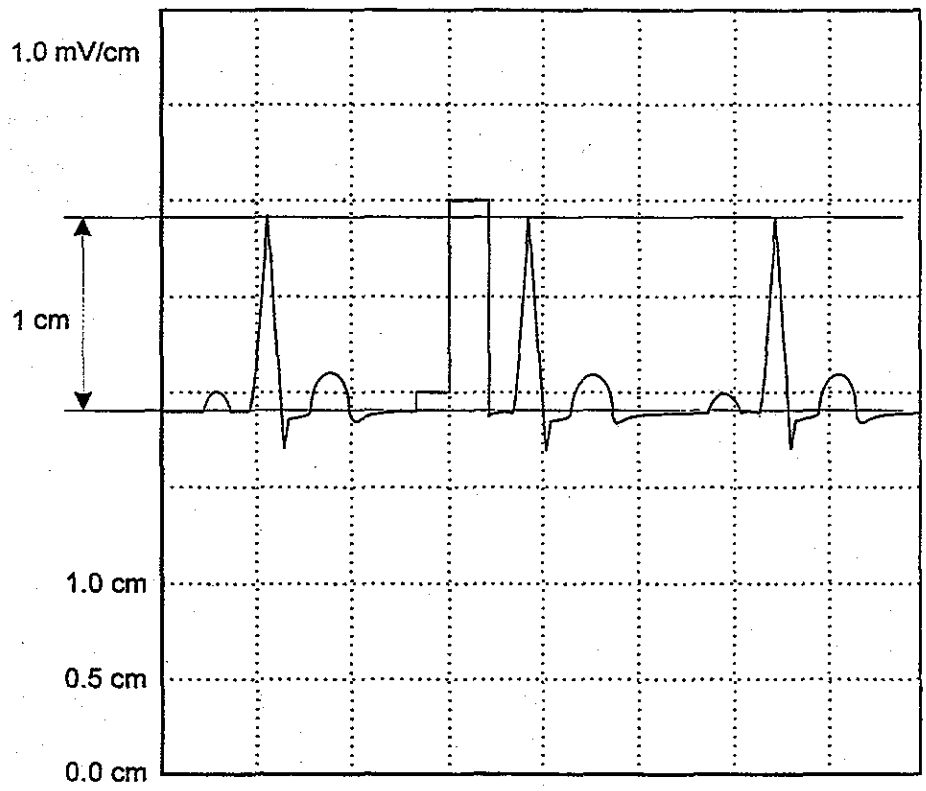


Figure 12-4: ECG Calibration Pulse

12.9 Respiration Tests

12.9.1 RESP Calibration Check

Press the **PAGE HOME** function key. Press the softkey adjacent to the **RESP** label. Press the **ALARM SUSPEND** function key. Configure an available trace to display the RESP waveform. Press the **SIZE** softkey. Increase the waveform size, using the **SIZE** ^^ softkey, if necessary. Press the **CAL** softkey. Ensure that a pulse appears on the **RESP** waveform. Pressing the **CAL** softkey repeatedly will present successive pulses on the RESP waveform.

If the ESCORT II is equipped with a recorder, verify that the respiration waveform on the recording strip is 2 ± 0.8 cm peak-to-peak amplitude.

12.9.2 RESP Baseline Reset Check

When the LA lead is disconnected and reconnected, ensure that the baseline returns to normal at the center of the RESP trace.

12.9.3 Pacer Artifact Check

Set the simulator to output a paced waveform. Select the ECG function. Turn on the ECG pacer function using the **PACE ON/OFF** softkey (as described in paragraph 12.8.4). Check that the pacer flags are not counted on the Respiration waveform.

12.9.4 Apnea Alarm Check

Set the simulator to produce an apnea greater than 10 seconds. On the **RESPIRATION SETUP** menu of the ESCORT II monitor, set alarms on. Set the **APNEA DELAY** to 10 seconds, ensure that the alarm sounds after the delay indicated. Verify that the front panel ALARM LED flashes while the alarm is in progress. Return the simulator respiration rate to 15 or 20 BPM.

12.9.5 High/Low Alarm Function Check

Turn on RESP alarms using the **ALARM ON/OFF** softkey. Set the RESP output of the patient simulator higher than the high alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Set the patient simulator RESP output lower than the low alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

12.10 SpO_2 Tests

12.10.1 Reference Saturation Check

Disconnect the ECG cable. Connect the NELLCOR PT-2500 Simulator to the SpO_2 connector. Configure an available trace to display the SpO_2 waveform. Press the **PAGE HOME** function key. Press the softkey adjacent to the **SPO2** label. Press the **ALARM SUSPEND** function key. Ensure that a saturation reading of 81 ± 2% is observed. If the ESCORT II is equipped with a recorder, press the **RECORD** function key followed by pressing the **SPO2** softkey. Ensure that a square wave is present on the recording strip.

12.10.2 Reference Pulse Check

With the NELLCOR PT-2500 connected, ensure that a pulse reading of 40 ± 2 BPM is displayed. Press the **SPO2** softkey. Press the **LOCK ON/OFF** softkey until ON is highlighted. Ensure that the **NO C-LOCK** message is displayed.

12.10.3 C-LOCK Message Check

Reconnect the ECG cable. Ensure that the **NO C-LOCK** message goes away after a few seconds. If alarms are still suspended, press the **ALARM SUSPEND** key again to enable alarms.

12.10.4 Finger Sensor Check

Disconnect the NELLCOR PT-2500 Simulator from the ESCORT II. Ensure that **NO SENSOR** message flashes on the screen. Connect a NELLCOR Finger Sensor. Ensure that the **SPO2 SRCH** message appears on the screen. Insert an index finger into the sensor clip. Ensure that the SpO_2 waveform and saturation reading appear on the screen after a few seconds.

12.10.5 High/Low Alarm Function Check

With the finger sensor connected to the ESCORT II, insert an index finger into the sensor clip. Set the high alarm limit to 70. Turn on SpO_2 alarms by using the **ALARM ON/OFF** softkey. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Set the SpO_2 alarms to OFF by using the **ALARM ON/OFF** softkey. Disconnect the finger sensor. Connect the NELLCOR PT-2500 Simulator to the monitor's input. Set the low alarm limit to 85. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

12.11 NIBP Tests

Note: All NIBP tests must be run when the monitor's NIBP test setting is in the CHECK mode.

12.11.1 Inflation Time and Maximum Pressure Check

Connect a digital manometer to the bottom NIBP fitting. Press the **PAGE HOME** function key. Press the **NEXT PAGE** function key twice. On the **SYSTEM SETUP** menu, select the **TEST** softkey. Cycle the **NIBP TEST** softkey until **CHECK** mode is highlighted. Press **PAGE HOME**, followed by pressing the softkey adjacent to the **NIBP** label. Simultaneously, start a stopwatch and press the **START** softkey. Observe the stopwatch timer and the manometer readings; ensure that the time is less than or equal to 9 seconds when the manometer reads 250 mmHg. Allow the pump to continue to run for an additional 15 seconds. Ensure that the pump pressure never exceeds 330 mmHg.

12.11.2 Overpressure Detection Check

Verify that the ESCORT II is configured in **ADULT** mode. Connect the manometer using a 'Y' adapter to both bulkhead connectors on the ESCORT II. Press **PAGE HOME**, followed by pressing the softkey adjacent to the **NIBP** label. Press the **START** softkey. Wait until the pump stops and then continue to pump the system using the manometer's inflation bulb. Ensure that the overpressure switch activates and vents the system between 255 and 280 mmHg. Press the **STOP** key, and bleed off any additional air from the system.

Configure the monitor to **NEO** mode and return to the NIBP menu. Press the **START** softkey. Wait until the pump stops and then continue to pump the system using the manometer's inflation bulb. Ensure that the overpressure switch activates and vents the system between 155 and 170 mmHg. Press the **STOP** key, and bleed off any additional air from the system. Switch monitor back to **ADULT** mode.

12.11.3 Five-Minute Time-out Check

Press the **PAGE HOME** function key, followed by pressing the softkey adjacent to the **NIBP** label. Connect the manometer to top fitting and pump to 60 to 70 mmHg and start the stopwatch. Observe that after 3:54 minutes to 5:24 minutes, the **CHECK CUF** message appears. Open the valve on the pressure bulb to bleed off the pressure and observe that the message goes away.

12.11.4 Additional NIBP Tests

Perform the Calibration Check, Leak Test, and Oscillation Waveform Test. These procedures are presented in section 7.7, "NIBP Diagnostics."

12.11.5 High/Low Alarm Function Check

Connect the Dynatech NIBP Analyzer with a 'Y' adapter to both bulkhead connectors on the ESCORT II. Press the **PAGE HOME** function key. Press the **NEXT PAGE** function key twice. On the **SYSTEM SETUP** menu, select the **TEST** softkey. Cycle the **NIBP TEST** softkey until the **OFF** mode is highlighted. Press **PAGE HOME** again. Press the softkey adjacent to the **NIBP** label. Press **NEXT PAGE**. Turn on the NIBP alarms by using the **ALARM ON/OFF** softkey. Set the systolic alarm of the ESCORT II to 140. Set the analyzer's systolic pressure higher than 140. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Set the analyzer's systolic pressure lower than the low alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Repeat for diastolic and mean alarms.

12.12 Temperature Tests

12.12.1 Temperature Check

Press the **PAGE HOME** function key. Press the softkey below the **TEMP** label. Check for no temperature indication (dashed lines on the screen). Connect the temperature simulator to the TEMP input of the monitor. Set the simulator to 25° C. Check that the temperature on monitor reads within 0.2° for both YSI 400 and YSI 700 type probes. Repeat the above for 37° C and 40° C.

12.12.2 High/Low Alarm Function Check

Turn on the TEMP alarms by using the **ALARM ON/OFF** softkey. Set the temperature simulator output higher than the high alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Set the temperature simulator output lower than the low alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

12.13 IBP Tests

12.13.1 ZERO Check

Configure an available trace for BP1. Press the **PAGE HOME** function key. Press the softkey adjacent to the **BP1** label. Plug the waveform simulator into the monitor's BP1 connector. Ensure that a flashing **ZERO BP1** message appears. Set the simulator to zero pressure. Press the **ZERO** softkey. Ensure that the flashing **ZERO BP1** message disappears. Repeat the above procedure for BP2, if installed.

12.13.2 Waveform Check

Set the simulator to output dynamic pressure (e.g., 120/80). Ensure that a standard invasive blood pressure waveform is present.

12.13.3 Static Gain Accuracy Check

Rezero the IBP waveform. Set the simulator to output a static pressure of 100 mmHg. Ensure that a reading of 100 mmHg is displayed on the monitor with an accuracy of 1 mmHg.

12.13.4 High/Low Alarm Function Check

Turn on BP1 alarms by using the **ALARM ON/OFF** softkey. Set the patient simulator BP1 output higher than the high alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Set the patient simulator BP1 output lower than the low alarm limit. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Repeat all IBP tests for BP2 (if installed).

12.14 End Tidal CO_2 Tests

12.14.1 "No Sensor" Check

Connect the simulator to the ECG input on the ESCORT II. Set ECG to 80 BPM and RESP to 15 BPM. Configure RESP and CO_2 for traces 2 and 3 respectively. Set Respiration Rate source to AUTO. Press the **PAGE HOME** function key. Press the softkey adjacent to the CO2 label. Verify that the **NO SENSOR** message appears on the CO_2 trace. Verify that the RESP rate is equal to the simulator rate.

12.14.2 CO_2 Power-Up Sequence Check

Plug in a CO_2 sensor to the monitor. Ensure that the **WARM UP** message is displayed. After a few seconds, the **WARM UP** message will be replaced by the **START UP** message. Wait about 60 seconds and ensure that the sensor light illuminates.

12.14.3 CO_2 Operation Check

Breathe into the disposable airway adapter on the CO_2 sensor. Ensure that a normal CO_2 capnogram appears on the CO_2 trace with a value between 30 and 60 mmHg. Ensure also that the RESP count is equal to the breath rate.

12.14.4 High/Low Alarm Function Check

Set the ESCORT II CO_2 high alarm limit to 20. Breathe into the disposable airway adapter until a value greater than 20 is displayed. Turn on the CO_2 alarms using the **ALARM ON/OFF** softkey. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing. Turn the CO_2 alarms OFF. Set the high alarm limit to 80 and set the low alarm limit to 50. Breathe into the disposable airway adapter again and turn the CO_2 alarms ON. Ensure that the alarm tone sounds while the front panel ALARM LED is flashing.

12.14.5 Respiration Source Check

Turn off the CO_2 parameter using the **CO2 ON/OFF** softkey and verify the RESP count returns to the simulator rate after a few seconds. Discard the disposable airway adapter at the conclusion of the tests.

12.15 Cardiac Output (CO) Tests

Note: ***To perform the following Cardiac Output tests, precision resistance (1%) must be applied to the reference designations at the ESCORT II's CO connector, as indicated for each test. See Figure 12-5 for details.***

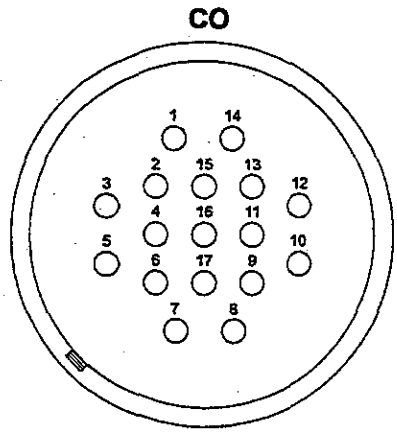


Figure 12-5: Cardiac Output Connector Designations

12.15.1 Blood Temperature (Tb) Tolerance Check

Configure Trace 3 for CO. Press the **PAGE HOME** function key. Press the softkey adjacent to the **CO** label. Using Table 12-1 as a guide, set the resistance values across THA and THB and across THB and THD, as indicated. Observe that for each setup, the blood temperature (Tb) displayed on the ESCORT II's screen is within tolerance.

Table 12-1: Cardiac Output Calibration Values for Blood Temperatures

RESISTANCE ACROSS THA-THB	RESISTANCE ACROSS THB-THD	BLOOD TEMPERATURE
9.76 kohms	30.484 kohms	17.0 ± 0.1° C
9.76 kohms	14.000 kohms	37.0 ± 0.1° C
9.76 kohms	11.304 kohms	43.0 ± 0.1° C

12.15.2 Flow Through (Ti) Tolerance Check

Configure Trace 3 for CO. Press the **PAGE HOME** function key. Press the softkey adjacent to the **CO** label. Using Table 12-2 as a guide, set the resistance values across BAB and FL, as indicated. Observe that for each setup, the flow through temperature (Ti) displayed on the ESCORT II's screen is within tolerance.

Table 12-2: Cardiac Output Calibration Values for Flow Through Temperatures

RESISTANCE ACROSS BAB-FL	FLOW THROUGH TEMPERATURE
84.510 kohms	5.0 ± 0.1° C
78.850 kohms	10.0 ± 0.1° C
62.760 kohms	25.0 ± 0.1° C

12.15.3 Bath Tolerance Check

Configure Trace 3 for CO. Press the **PAGE HOME** function key. Press the softkey adjacent to the **CO** label. Using Table 12-3 as a guide, set the resistance values across BAA and BAC and across BAB and BAC, as indicated. Observe that for each setup, the bath temperature displayed on the ESCORT II's screen is within tolerance.

Table 12-3: Cardiac Output Calibration Values for Bath Temperatures

RESISTANCE ACROSS BAA-BAC	RESISTANCE ACROSS BAB-BAC	BATH TEMPERATURE
94.980 kohms	19.500 kohms	0.0 ± 0.1° C
58.750 kohms	11.940 kohms	10.0 ± 0.1° C
30.000 kohms	6.000 kohms	25.5 ± 0.1° C

PERFORMANCE CHECK LIST

MODEL: _____ **TECHNICIAN:** _____

SERIAL NUMBER: _____ **DATE:** _____

LEAKAGE TEST

MPM Leakage/Hipot ..... OK_____
Patient Input Leakage — ALL LEADS ..... < 10 µA_____
Patient Input Leakage — CASE TO GND to NORM ..... < 20 µA_____
Patient Input Leakage — NORM to REV ..... < 20 µA_____

SAFETY TEST

Chassis Ground Resistance Test ..... OK_____
Chassis Leakage/Hipot ..... OK_____

KEYPAD CHECK

Keypad Check ..... OK_____

MAINFRAME CHECK

Mainframe Software ..... OK_____
Date and Time Check ..... OK_____
Line Frequency Check ..... OK_____
System AC Current Check ..... OK_____
External DC Operation ..... OK_____

BATTERY CHECK

Batteries #1 ..... OK_____
Batteries #2 ..... OK_____

RECORDER CHECK

Single Parameter Recording Check ..... OK_____
Dual Parameter Recording Check ..... OK_____
Trend Check ..... OK_____

ECG TESTS

ECG Lead Check ..... OK_____
Lead Fail and Baseline Reset Tests ..... OK_____
High/Low Alarm Function Check ..... OK_____
Pacer Flag Insertion Check ..... OK_____
ECG Calibration ..... OK_____
QRS Tone Check ..... OK_____

RESPIRATION TESTS

RESP Calibration Check ..... OK_____
RESP Baseline Reset Check ..... OK_____
Pacer Artifact Check ..... OK_____
Apnea Alarm Check ..... OK_____
High/Low Alarm Function Check ..... OK_____

SpO_2 TESTS

Reference Saturation Check ..... OK_____
Reference Pulse Check ..... OK_____
C-LOCK Message Check ..... OK_____
Finger Sensor Check ..... OK_____
High/Low Alarm Function Check ..... OK_____

NIBP TESTS

Inflation Time and Maximum Pressure Check ..... OK_____
Overpressure Detection Check ..... OK_____
Five-Minute Time-out Check ..... OK_____
Additional NIBP Tests ..... OK_____
High/Low Alarm Function Check ..... OK_____

TEMPERATURE TESTS

Temperature Check ..... OK _____
High/Low Alarm Function Check ..... OK_____

IBP TESTS

ZERO Check ..... OK_____
Waveform Check ..... OK_____
Static Gain Accuracy Check ..... OK_____
High/Low Alarm Function Check ..... OK_____

END TIDAL CO_2 TESTS

"No Sensor" Check ..... OK_____
CO_2 Power-Up Sequence Check ..... OK_____
CO_2 Operation Check ..... OK_____
High/Low Alarm Function Check ..... OK_____
Respiration Source Check ..... OK_____

CARDIAC OUTPUT TESTS

Blood Temperature (Tb) Tolerance Check ..... OK_____
Flow Through (Ti) Tolerance Check ..... OK_____
Bath Tolerance Check ..... OK_____

13 CARE AND CLEANING

WARNING: To avoid electric shock, unplug the AC power cord before cleaning.

WARNING: Do not immerse the instrument or its accessories in liquids. Do not use caustic or abrasive cleaners that will damage the housing.

13.1 Guidelines for Cleaning the Monitor

Use the following guidelines and considerations when cleaning the ESCORT II monitor:

- Periodically, the monitor, cuffs, and hoses should all be cleaned. Only use a lint free, nonabrasive cloth which has been slightly dampened with a mild detergent.
- Avoid harsh cleaning solutions which might harm plastic surfaces.
- Do not immerse monitor, cuffs, or hoses in liquids.
- Do not clean with isopropyl alcohol or other solvents that may harm plastics.
- Do not spray or pour liquids directly onto the monitor or its accessories.
- Do not allow any liquid to come into contact with the power connector, fuse holder, or switches.
- Do not allow any liquids to penetrate connectors or the monitor chassis.

13.2 Guidelines for Cleaning the Defibrillator/Pacer

WARNING: To avoid electric shock, unplug the AC power cord before cleaning.

WARNING: Do not immerse paddles, cables, or electrical connectors in liquids during cleaning and disinfection. Do not allow liquids to come into contact with switches, cables, or electrical connectors.

Use the following guidelines when cleaning the defibrillator and its accessories:

Defibrillator Paddles

- Routine cleaning consists of removing dust and dirt from exterior surfaces. Cleaning agents such as a mild soap and water solution or a standard hospital cleaning agent may be used.
- The defibrillator paddles should be cleaned and disinfected after each use. Blood stains may be removed by wiping the stained area for a few minutes with a blood solvent, such as hydrogen peroxide.
- Do not submerge the defibrillator paddles or the electrical connector in any liquid during cleaning and disinfection procedures. Use only lightly moistened pads to clean these items.
- Be careful to prevent liquid from entering the paddles or any other accessories. Liquid in these areas may cause malfunction of the charge and discharge functions of the defibrillator.

WARNING: Do not autoclave any of the accessory items, including the defibrillator paddles.

Defibrillator Internal Paddles Sterilization Procedure

WARNING: The internal paddles are stainless steel, inactive instruments, insulated with a nonconductive coating. Be sure to protect all surfaces from anything that would scratch, abrade, or otherwise cause damage.

1. Separate each internal paddle by rotating counterclockwise while holding its handle. Repeat this procedure for the other internal paddle.
2. Sterilize the components as follows:

Handles, cables and connector:	Use gas sterilization for the entire assembly or cold sterilize only the handles and cables.
Internal paddles:	The internal paddles should be gas sterilized according to standard hospital practice.

Note: ***If gas (ETO) sterilization is used, the internal paddles need not be removed from the handles, except for the purpose of cleaning prior to sterilization.***

3. Screw and hand-tighten the internal paddles into the handles. Do not use tools to tighten as damage may occur. Observe sterile procedures as required for reassembly.

WARNING: Do not use ultrasonic methods or an abrasive to clean internal paddles. Do not autoclave or immerse in liquid.

WARNING: Do not use sterilization techniques that require the temperature to be in excess of 100 degrees Centigrade.

WARNING: The coating of internal paddles may be damaged if they are not sterilized according to the manufacturer's recommendation. Replace any worn or damaged paddles.

13.3 Repacking and Shipping the Monitor and/or Defibrillator/Pacer

Use the following guidelines if you need to ship the ESCORT II monitor and/or Defibrillator/Pacer for repair or relocation.

Note: ***Failure to follow the guidelines below may result in damage or loss. Equipment damaged due to improper packaging is not covered in the equipment's warranty, nor is the loss of equipment due to improper or inadequate shipping procedures.***

- The equipment must be packed carefully, ideally using the original shipping carton with foam packing material.
- If the original carton is not available, use a similar carton. Place the equipment in a plastic bag or air bubble cushioning material. Fill the bottom of the carton with approximately five (5) centimeters of polystyrene packing material. Place the equipment on the layer of packing material, and then fill all the remaining space in the carton with packing material.
- Seal the carton adequately.
- If shipping to Medical Data Electronic for repair, a Return Material Authorization number (RMA#) must be obtained. To obtain an RMA number, call MDE Technical Support at one of the telephone numbers listed at the front of this manual. It is necessary to have the model number and serial number of the equipment at hand along with a detailed description of the reason(s) why it needs to be returned to the factory.

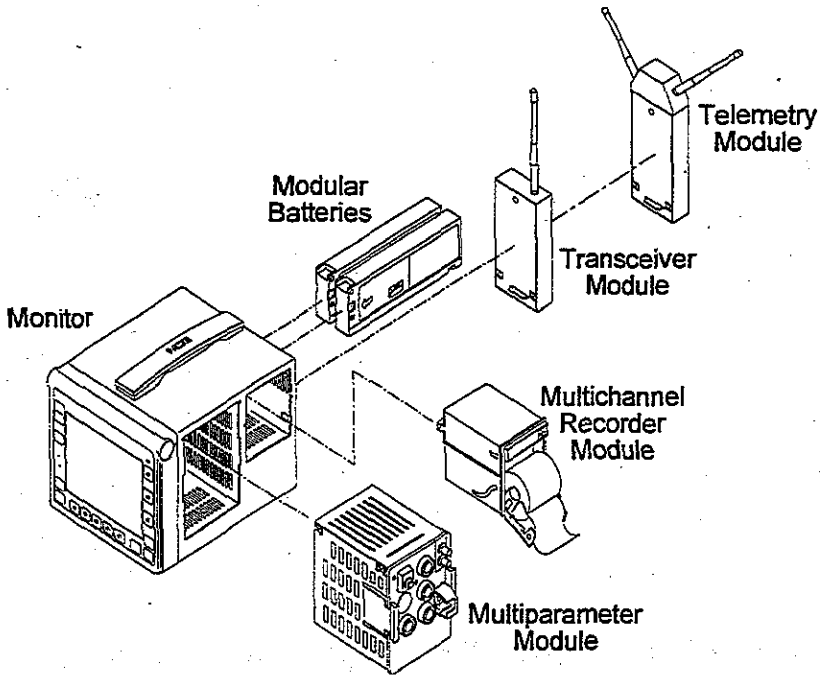
14

ESCORT II MODULES

14.1 Introduction

There are several modular (user-movable) components that can be shared by all ESCORT II monitors.

- The **Multiparameter Module (MPM)** - Allows you to share various configurations of parameters between monitors.
- The **Multichannel Recorder Module** - Provides manual and alarm recordings of any one or two waveforms simultaneously.
- The **Modular Batteries** - Supplies battery power to the ESCORT II monitor for operation in transport situations, or when AC power is not available.
- The **Transceiver Module** - Provides you with a quick and flexible way to include any ESCORT II monitor in the AutoNet™ wireless network.
- The **Telemetry Module** - Enables the ESCORT II monitor to be used with ambulatory ECG transmitters.



14.2 Multiparameter Module

Removing the Multiparameter Module

1. Release the Multiparameter Module by squeezing the side handles toward the center of the module (see Figure 14-2, below).
2. Continue to squeeze the handles while pulling the module straight out of the monitor.

Installing the Multiparameter Module

1. Align the Multiparameter Module so that the front panel parameter labels are facing you and are right-side up. Additionally, ensure the edges of the module are square with the edges of the monitor housing.
2. Push the Multiparameter Module into the monitor until it clicks into place.
3. To turn the monitor ON, press the ON (ON/STBY) fixed function key. After a few seconds, you should see parameter labels and associated data on the monitor display.

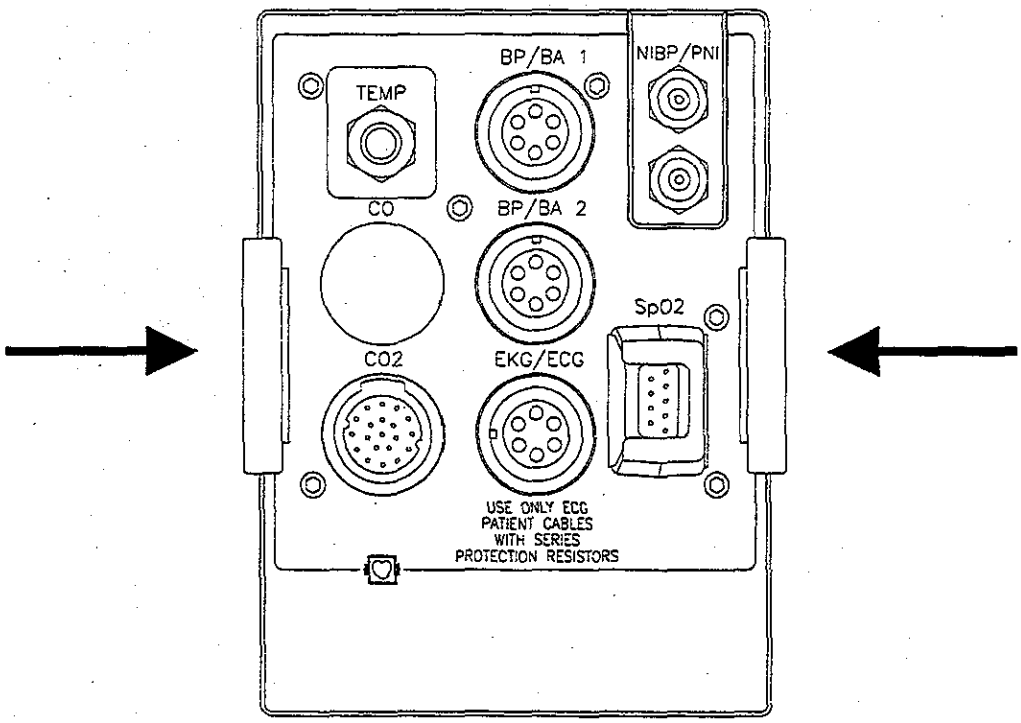


Figure 14-2: Removing the Multiparameter Module

Hewlett-Packard Merlin Connectors Option (ECG, BP1, BP2)

The Multiparameter Module can be optionally configured with HP Merlin connectors for ECG and Invasive Blood Pressure. Figure 14-3 illustrates the Multiparameter Module with HP Merlin connectors installed.

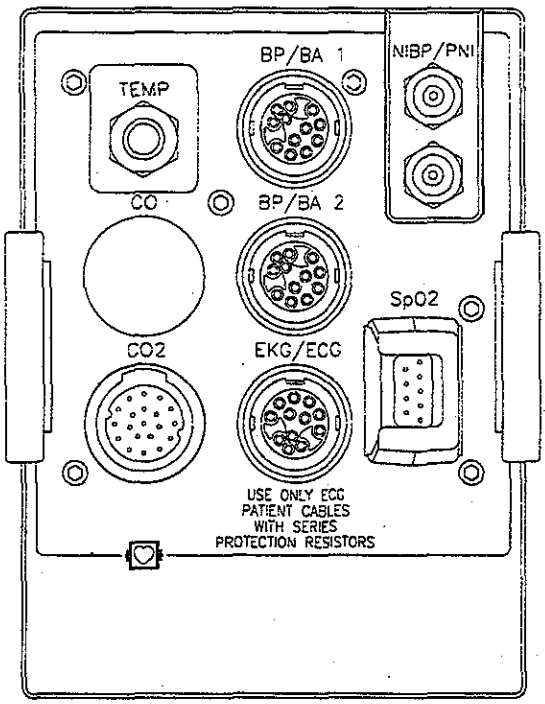
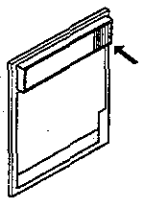


Figure 14-3: Multiparameter Module with HP Connectors (ECG, BP1, BP2)

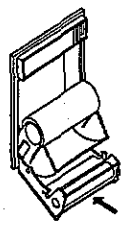
14.3 Multichannel Recorder Module

Removing the Multichannel Recorder Module

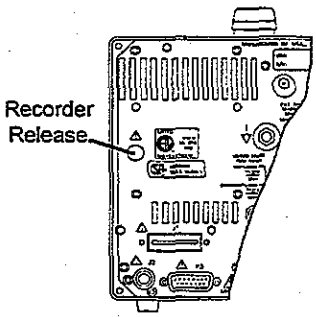
Note: Any installed add-on modules (i.e., transceiver or telemetry) must be removed prior to removing the recorder module. See the applicable removal instructions later in this chapter.



1. Open the recorder door by pressing the ridged end of the recorder door release.



2. Grasp the recorder door at the end closest to you. *Do not* attempt to remove the recorder module at this time.



3. Insert the blunt end of an instrument into the Multichannel Recorder Module's release slot, located on the rear panel of the monitor. Press inward while pulling the Multichannel Recorder Module toward you. Once the module is approximately one half inch (½") out of the monitor housing, you no longer need to press the release slot.

Note: Do not press the recorder's release slot with any instrument that may break or cause damage, such as the lead end of a pencil.

4. Continue pulling the recorder module toward you until it is completely out of the monitor.

Installing the Multichannel Recorder Module

Note: The monitor may reset when you install the Multichannel Recorder Module, and any patient data stored in the bedside monitor's memory may be lost.

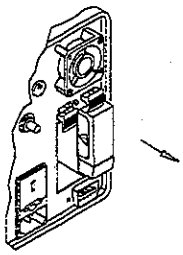
1. Align the recorder module so the recorder door is facing you, the door release is at the top, and the edges of the module line up with the edges of the monitor's housing.
2. Push the Multichannel Recorder Module straight into the monitor until it is securely in place (i.e., it cannot be removed unless the release is pressed again).

14.4 Modular Batteries

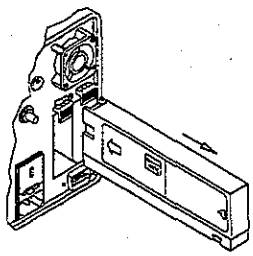
The ESCORT II 300 monitor includes two (2) individual 12V/2.3AH DC batteries capable of delivering power to the ESCORT II monitor for 2.5 to 4 hours of operation, depending on the monitor's configuration. Batteries may be recharged to 90% of their capacity within five (5) hours.

Note: ***Never discharge the batteries completely. To ensure long battery life, always re-charge batteries immediately after use. An optional battery charger (MDE Part Number: E2700-12) is recommended. Batteries should be replaced every two (2) years regardless of test results. Used batteries should be recycled or disposed of properly.***

Removing a Modular Battery

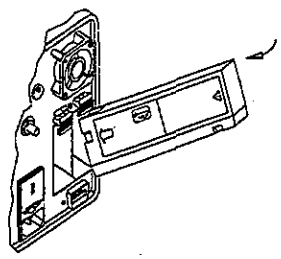


1. Press the battery lock on the rear panel of the ESCORT II monitor.

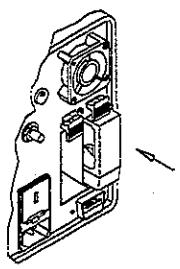


2. Gently slide the battery out from the battery slot.

Installing a Modular Battery



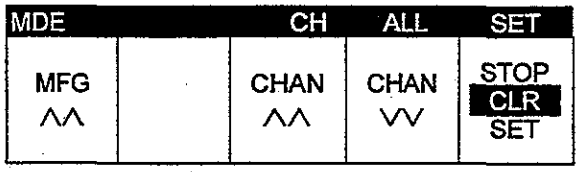
1. Place the battery into the battery slot as indicated.



2. Gently slide the battery into the battery slot until it locks firmly in place.

Note: ***To avoid corrosion, remove the batteries if the ESCORT II monitor is disconnected from AC power for an extended period of time.***

6. Press the STOPS softkey. The following page appears:



7. Press the MFG softkey to select the desired transmitter type, as described in the beginning of this section. Press the CHAN ∧∧ softkey to select higher channel numbers or the CHAN ∨∨ softkey to select the lower channel numbers. Press the STOP softkey to select CLR or SET channel.

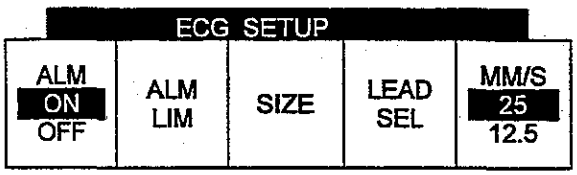
Note: ***To clear all stops stored in memory, press the NEXT PAGE function key, and then press the CLEAR ALL STOPS softkey. When prompted "ARE YOU SURE?", press the YES softkey. Pressing the EDIT STOPS softkey will revert to the previous telemetry setup page.***

Verify/Set the Telemetry Channel

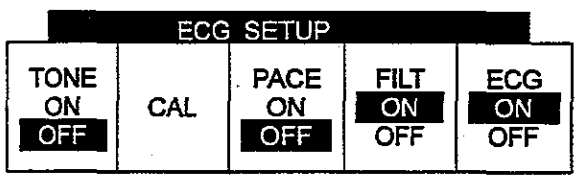
Note: ***The "telemetry-monitored" patient must be adequately prepared for proper telemetry function. Hospital personnel has the option of using either 3-lead or 5-lead monitoring depending on the type of transmitter used. In either case, proper lead attachment must be achieved with correct ECG electrodes. After the patient has been prepared, the transmitter is strapped onto the body of the patient using a transmitter pouch.***

The following steps describe how to verify and/or change the monitor's frequency mode:

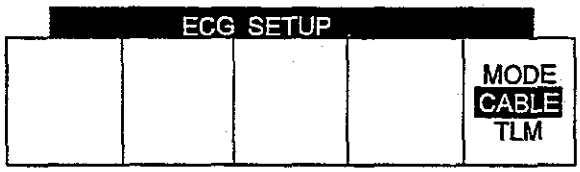
1. From the HOME PAGE state, press the softkey that corresponds to ECG. The following ECG SETUP page is displayed:



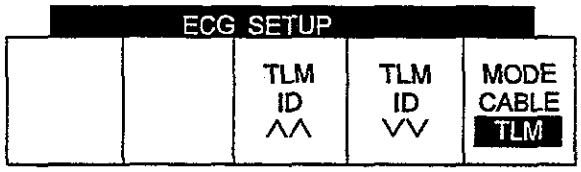
2. Press the NEXT PAGE softkey. The following ECG SETUP page is displayed:



3. Press the NEXT PAGE softkey again. The following ECG SETUP page is displayed:



4. Press the MODE softkey to select TLM (Telemetry). The following ECG SETUP page is displayed:



5. Press the TLM ID ∧∧/∨∨ softkey to select the transmitter ID of the patient.

Allow a couple of seconds for each channel to settle. The ECG waveform of the patient being monitored will appear on the display together with a calculated heart rate.

The channel ID of the transmitter is displayed in the upper area of the monitor's screen, just to the right of the ADULT/NEO/PED mode indication. If the receiver loses communication with the transmitter, a NO SIGNAL message will be displayed. After communication is established, a message that reads "SIGNAL" appears in the parameter message area for the ECG parameter.

WARNING: Telemetry ID and lead selection on the monitor must be identical to that of the remote transmitter. Incorrect settings may cause the ESCORT II to display ECG information from a different patient that is assigned to another telemetry ID number.

Note: The ESCORT II monitor will display a squelch, or triangular, waveform when excessive signal noise is present. This waveform is displayed in lieu of a noisy ECG waveform which could cause unnecessary alarms.

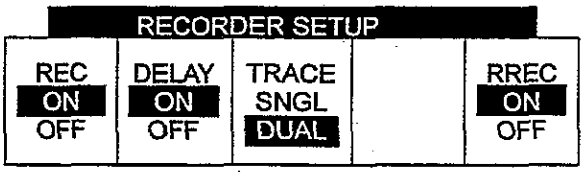
Note: The ESCORT II monitor can default to CABLE (standard ECG cable with electrodes), TELM (telemetry), or LAST via system setup. See Chapter 15, "System Defaults & Messages," for details. If LAST is selected, the ESCORT II will power-up to either CABLE or TELM depending on what was last used as an ECG source.

Recording the Telemetry ECG Waveform

A push button is provided at the top of the patient's transmitter. To record the ECG output waveform, press the push button. A pulse is sent to the telemetry module to initiate a 16-second remote recording. The time, date, transmitter ID, ECG waveform, and additional information will be printed on the recording strip.

Remote recording must first be enabled at the ESCORT II monitor from the RECORDER

SETUP page, which appears as follows:



Press the RREC (Remote Record) softkey to select ON. Telemetry recording will now be activated.

Appendix A

SPECIFICATIONS

PHYSICAL

Size (10.4): 9.3 x 11.8 x 10.2 in./23.6 x 30.0 x 25.9 cm (HWD)
Size (8.4): 8.2 x 9.9 x 11.1 in./20.8 x 25.1 x 28.2 cm (HWD)
Weight (10.4): 12.45 lb. (5.7 kg) with MPM and ECG
Weight (8.4): 13.45 lb. (6.15 kg) with MPM and ECG
Weight with 2 Batteries: add 2.9 lb (1.3 kg)

DISPLAY

Type: Thin film electroluminescent (EL) or Color Active Matrix TFT LCD
Size: 10.4 or 8.4 inch diagonal
Number of Traces: 4
Resolution: 640 x 480 pixels
Trace Length: 5 seconds

FRONT PANEL KEY FUNCTIONS

Freeze, Record, Alarm Suspend, Alarm Set Up, Page Home,
Next Page, Patient Type, NIBP Start/Stop, 11 Softkeys, On/Standby

ECG

Range: 10 to 300 BPM
Accuracy: ± 2% or ± 2 BPM
Sweep Speed: 12.5, 25, 50 mm/sec selectable

High Alarm Limit Range:	50 to 250 BPM in 5 BPM steps	ADULT
	60 to 255 BPM in 5 BPM steps	PED/NEO
Low Alarm Limit Range:	20 to 150 BPM in 5 BPM steps	ADULT
	20 to 150 BPM in 5 BPM steps	PED/NEO

Bandwidth: 0.5 to 40 Hz (monitor); 0.05 to 100 Hz (diagnostic)
Leads: 3 lead: I, II, or III selectable
5 lead, dual vector: I, II, or III, and V selectable
Sensitivity: 0.25 to 3 mV/cm selectable (12 levels)
Pacer Rejection: 0.1 to 2 msec; 2 to 700 mV
Heart Rate Source: ECG, Pleth, IBP
Defibrillation Tolerance: 400 joule with 50 ohm series lead impedance
Connector: Standard 6 pin MS
Isolation: Full electrical isolation

RESPIRATION

Range: 4 to 200 BPM
Accuracy: ± 2% or ± 2 BPM
Lead: RA to LA
Sensitivity: 0.25 to 3 ohm/cm selectable

High Alarm Limit Range:	30 to 150, OFF	ADULT

	50 to 200, OFF	PED/NEO
Low Alarm Limit Range:	5 to 50, OFF	ADULT
	5 to 80, OFF	PED/NEO
Apnea Delay Alarms:	10, 15, 20, 30, 40 seconds, and OFF	ADULT
	10, 15, 20 seconds, and OFF	PED/NEO

Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable
Respiration Rate Source: $ETCO_2$ or Leads
CVA Rejection: Rejects most cardiovascular coincidence

SpO_2

Display: % SpO_2, Plethysmographic Waveform or Pulse Amplitude Bar
SpO_2 Range: 20 to 100%
SpO_2 Accuracy: Adult 70 to 100% ± 2%; 50 to 69% ± 3%
Neonatal 70 to 94% ± 3%
Pulse Rate Range: 35 to 250 BPM
Pulse Rate Accuracy: ± 3 BPM

High Alarm Limit Range:	70 to 100%	ADULT/PED/NEO
Low Alarm Limit Range:	50 to 99%	ADULT/PED/NEO

Sensors: Neonatal to Adult (NELLCOR)
Pulse Tone: Pitch varies with SpO_2
ECG Sync: NELLCOR C-Lock®

INVASIVE BLOOD PRESSURE

Channels: 1 or 2
Range: -40 to 300 mmHg
Accuracy: ± 1 % or ± 1 mmHg
Alarms: SYS, DIAS, and MEAN selectable in 5 mmHg steps

Systolic Alarm Limit Range:	High	40 to 240 mmHg	ADULT
		5 to 210 mmHg	PED/NEO
	Low	0 to 150 mmHg	ADULT
		0 to 120 mmHg	PED/NEO
Diastolic Alarm Limit Range:	High	20 to 180 mmHg	ADULT
		5 to 150 mmHg	PED/NEO
	Low	0 to 120 mmHg	ADULT
		0 to 90 mmHg	PED/NEO
Mean Alarm Limit Range:	High	20 to 200 mmHg	ADULT
		5 to 170 mmHg	PED/NEO
	Low	0 to 130 mmHg	ADULT
		0 to 100 mmHg	PED/NEO

Sweep Speed: 12.5, 25, 50 mm/sec selectable
Display Scale: 15, 30, 60, 120, 180, 240 mmHg selectable
Input Connector: Standard 6 pin MS; 5 μV/V/mmHg

NIBP

Measurement method: Oscillometric

Measurement range:	Systolic	30 to 270 mmHg	ADULT
		30 to 145 mmHg	PED/NEO
	Diastolic	20 to 240 mmHg	ADULT
		20 to 130 mmHg	PED/NEO
	Pulse Rate	30 to 250 BPM	ADULT/PED/NEO

Measurement time: 40 seconds typical
Manual Operation: initiated via START key.
Automatic Operation: STAT, 1, 2, 3, 4, 5, 10, 15, 30, 45 minutes, 1, 2, 3, 4 hours

1st Cuff Inflation:	90 to 220 mmHg selectable	ADULT
	60 to 150 mmHg selectable	PED/NEO

Subsequent Inflations: Systolic +25 mmHg

Alarms: SYS, DIAS, and MEAN selectable in 5 mmHg steps

Systolic Alarm Limit Range:	High	100 to 240 mmHg	ADULT
		70 to 210 mmHg	PED/NEO
	Low	50 to 150 mmHg	ADULT
		25 to 120 mmHg	PED/NEO
Diastolic Alarm Limit Range:	High	80 to 180 mmHg	ADULT
		50 to 150 mmHg	PED/NEO
	Low	30 to 120 mmHg	ADULT
		10 to 90 mmHg	PED/NEO
Mean Alarm Limit Range:	High	90 to 200 mmHg	ADULT
		60 to 170 mmHg	PED/NEO
	Low	40 to 130 mmHg	ADULT
		15 to 100 mmHg	PED/NEO

System Accuracy: ± 5 mmHg Mean; ± 8 mmHg Standard Deviation
Cuff sizes: Thigh, Large Adult, Adult, Child, Infant, Neo sizes 1, 2, 3, 4

Mainstream $ETCO_2$

Type: Mainstream, NDIR single-beam ratiometric
Sensor Size: 0.78 x 1.036 x 1.003 inches/1.98 x 2.63 x 2.55 cm (LWD)
Sensor Weight: < 10 gm, excluding cable
Airway Adapter Dead Volume: < 6 cc (Std); 0.6 cc (Neo)
Altitude/Barometric Pressure Compensation: Automatic
Warm Up: 45 seconds typical
Range: 0 to 99 mmHg
Accuracy: ± 2 mmHg or ± 5% of reading
Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable
Display Scale: 50, 75, 100 mmHg

High Alarm Limit Range:	20 to 100 mmHg	ADULT/PED/NEO
	3 to 13 %	ADULT/PED/NEO
Low Alarm Limit Range:	5 to 50 mmHg	ADULT/PED/NEO
	1 to 7%	ADULT/PED/NEO

High Limit Inspired CO_2: 4 to 12 mmHg, selectable
Response Time: < 60 msec max, 30 msec typical
Calibration: None required; annual check recommended
O_2 and N_2O Compensation: Independently selectable

Sidestream $ETCO_2$

Type: Sidestream, NDIR single-beam, ratiometric
Sensor Size: 6.3 x 3.15 x 2.17 inches/160 x 80 x 55 cm (LWD)
Sensor Weight: 1.5 lbs/680 mg including cable
Altitude/Barometric Pressure Compensation: Automatic
Warm Up: 45 seconds typical
Range: 0 to 99 mmHg
Accuracy: ± 2 mmHg or ± 5% of reading below 77 mmHg, 10% above 77 mmHg
Respiration Rate: 0 to 60 breaths per minute
Sweep Speed: 1.56, 6.25, 12.5, 25 mm/sec selectable
Display Scale: 50, 75, 100 mmHg

High Alarm Limit Range:	20 to 100 mmHg	ADULT/PED/NEO
	3 to 13 %	ADULT/PED/NEO
Low Alarm Limit Range:	5 to 50 mmHg	ADULT/PED/NEO
	1 to 7%	ADULT/PED/NEO

High Limit Inspired CO_2: 4 to 12 mmHg, selectable
Sampling Flow Rate: 150 cc/min
Response Time: < 100 msec max
Calibration: None required; annual check recommended

Atmospheric Pressure: 700 to 1060 mbar

STORAGE AND TRANSPORT ENVIRONMENT

Temperature: -40° C to +70° C
Humidity: 10 to 100%, including condensation
Atmospheric Pressure: 500 to 1060 mbar

EQUIPMENT CLASSIFICATION

Mode of Operation: Continuous
Type of Protection from Electric Shock: IEC Class I, internally or externally powered
Degree of Protection from Electric Shock: Type CF defibrillation-proof
Degree of Protection from Water: Ordinary equipment

LEAKAGE CURRENT

Ground: < 100 μA
Patient: < 10 μA

ISOLATION VOLTAGE

Patient Isolation Voltage: < 4000 Vrms @ 60 Hz